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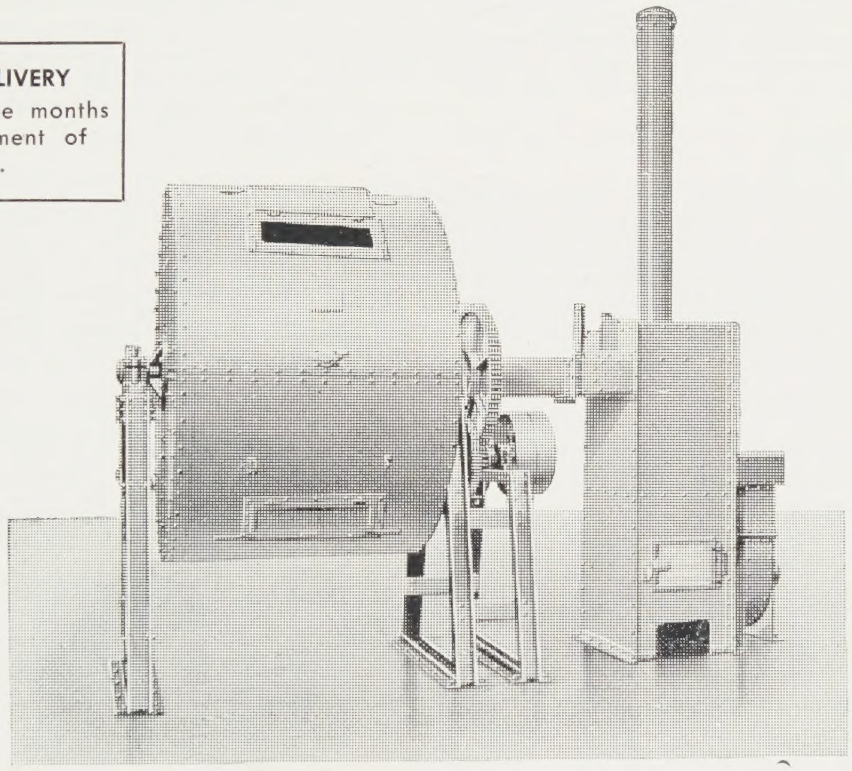

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The South Pacific Commission

The South Pacific Commission is an advisory and consultative body set up in 1947 by the six Governments responsible for the administration of island territories in the South Pacific region (Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America).

The Commission's purpose is to advise the participating Governments on ways of improving the well-being of the people of the Pacific island territories. It is concerned with health, economic and social matters. Its headquarters are at Nouméa, New Caledonia.

The Commission consists of not more than twelve Commissioners, two from each Government. It normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

There is a Research Council meeting once a year. This may be either a meeting of the full Council, or of one or other of its three main sections, specializing in the fields of health, economic development and social development. Members of the Research Council are appointed by the Commission. They are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission on what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

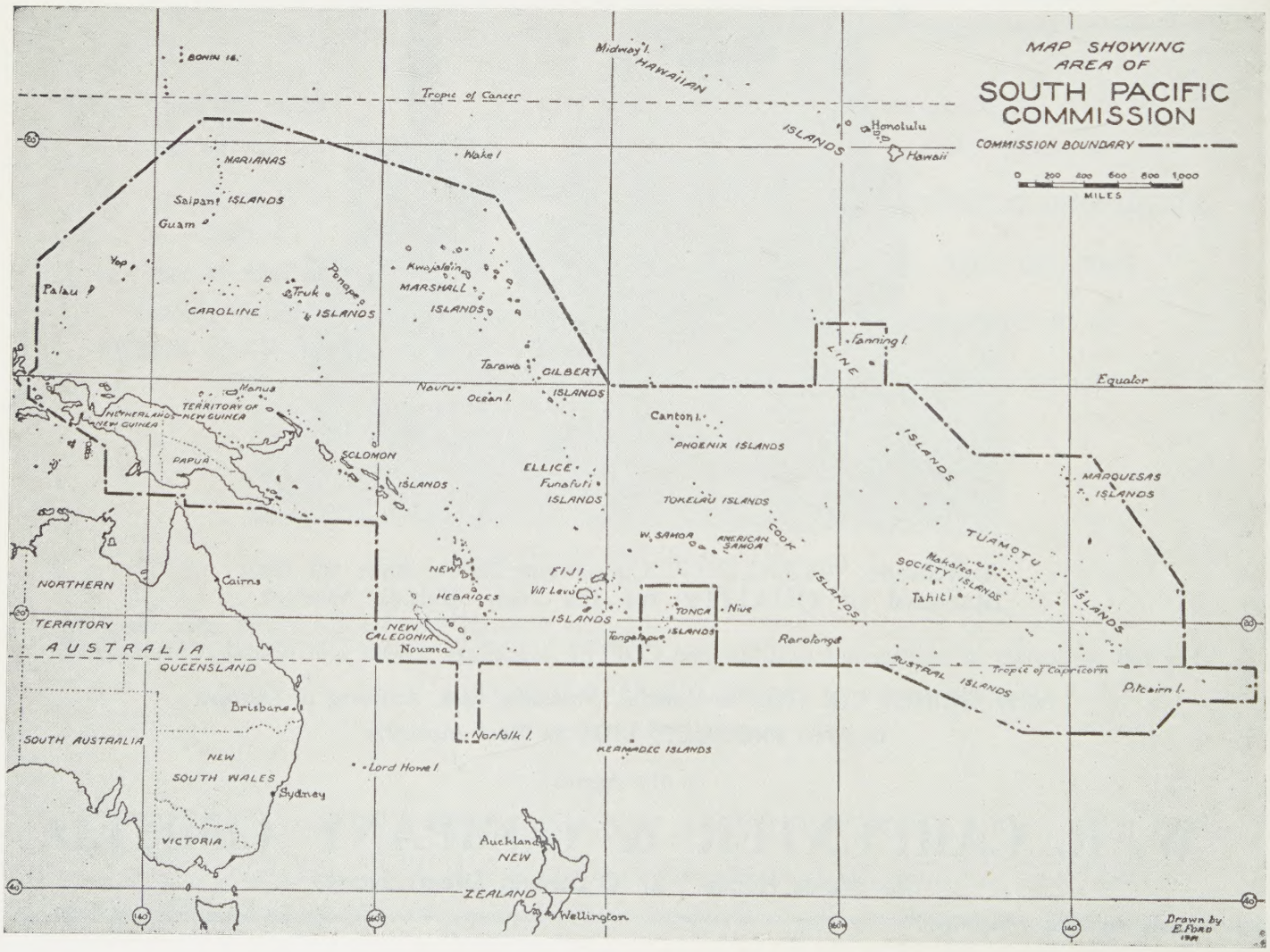
The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Fiji in April 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April 1953. The third Conference was held in Fiji in April-May 1956.

The principal officers of the Commission are: Secretary-General, Mr. T. R. Smith; Executive Officer for Health, Dr. E. Massal; Executive Officer for Economic Development, Dr. A. H. J. Kroon; Executive Officer for Social Development, Dr. Richard Seddon. The powers and functions of the Deputy Chairman, Research Council, are exercised by the Secretary-General.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Nouméa, New Caledonia.

FRONT COVER PHOTOGRAPH

Aided self-help on Niue Island. In a mobile crusher provided by the Administration, voluntary workers crush stone to build a new water tank and a community centre for Toi village. By combined effort the people and Administration of Niue Island have successfully completed many such projects (see article on page 20).



SPC QUARTERLY BULLETIN

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THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

SUBSCRIPTIONS and orders for single copies should be directed to: South Pacific Commission, Box 5254, G.P.O., Sydney, Australia. Subscription rates are given in the Table below.

ALL OTHER ENQUIRIES relating to the SPC QUARTERLY BULLETIN should be directed to: The Editor, South Pacific Commission, Nouméa, New Caledonia.

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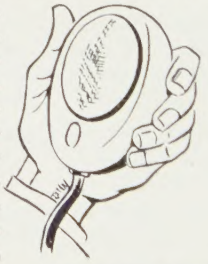

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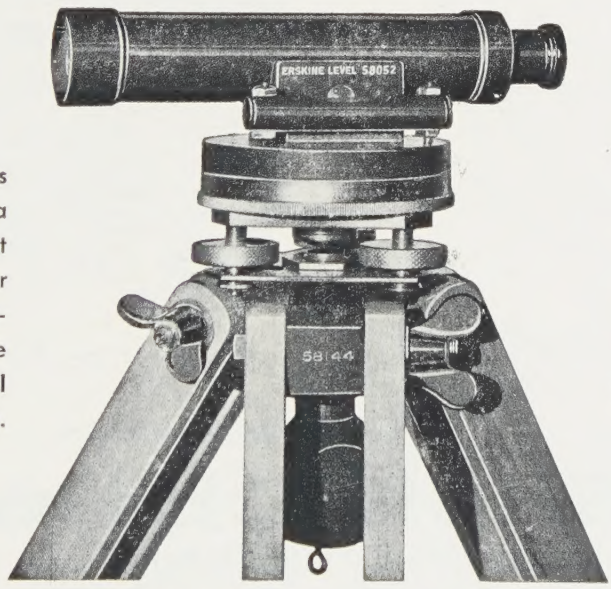

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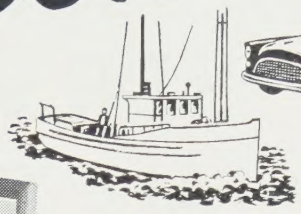

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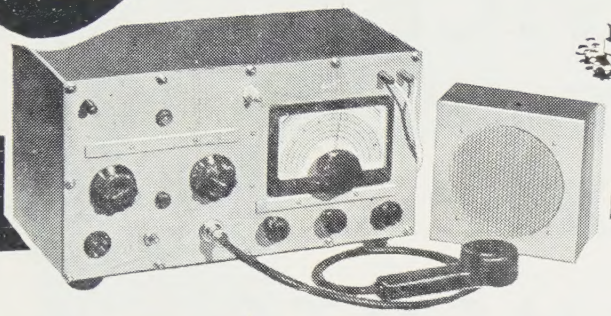

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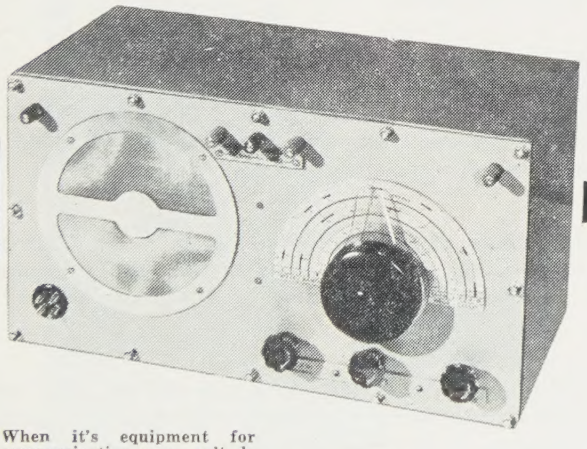

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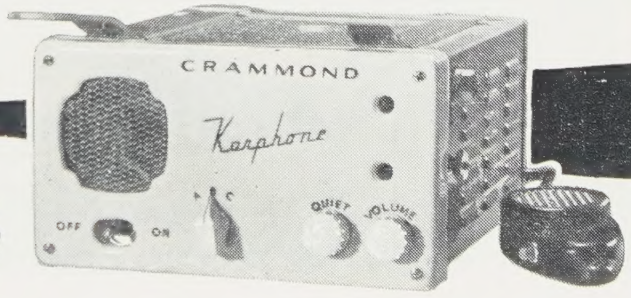

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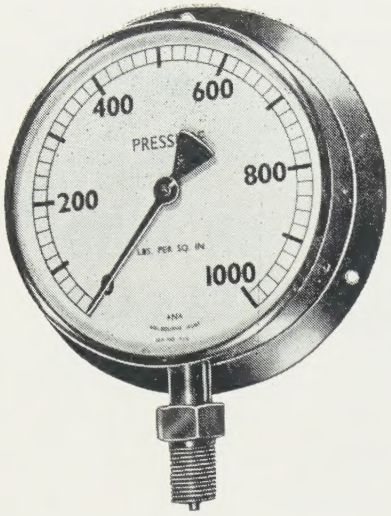

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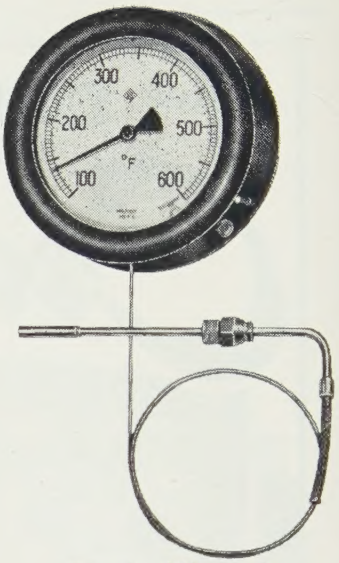

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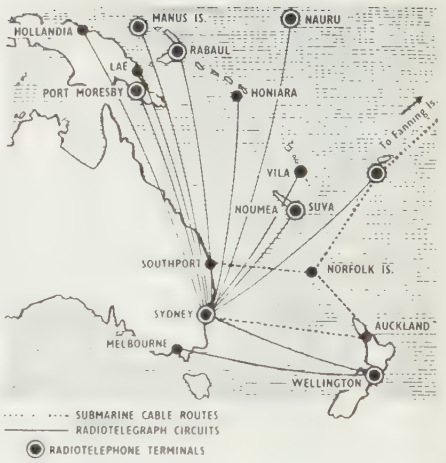

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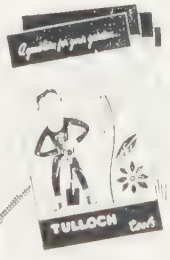

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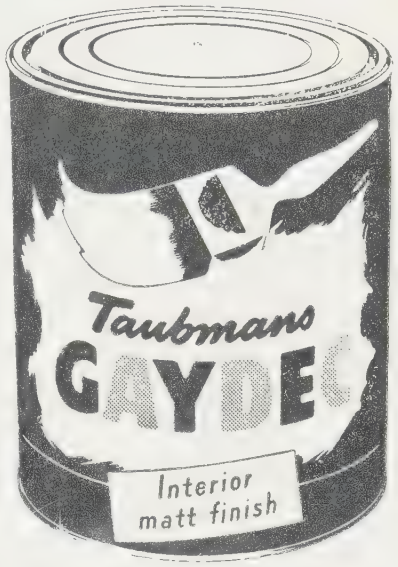

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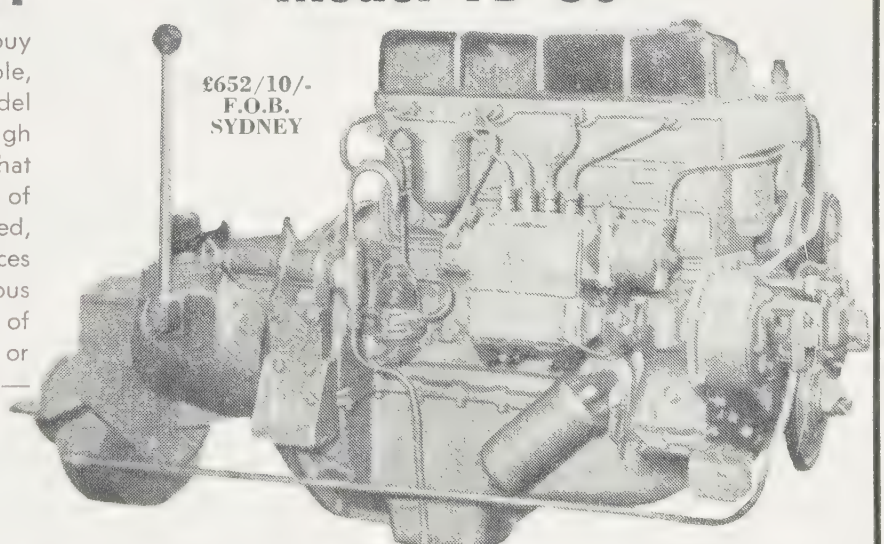

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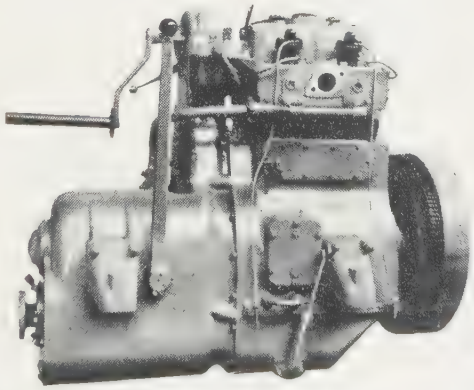

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SPC Co-operatives Meeting at Port Moresby

This store is owned by the native co-operative society at Hanuabada, near Port Moresby. Actively encouraged by the Administration, the co-operative movement is now very strongly established in Papua and New Guinea.

In relation to the advancement of the peoples of the South Pacific territories, what is the place and practical value of co-operative organization? What relationship exists or should exist between government and co-operative societies? What particular types of co-operative organization appear to be especially suited to the present stage of development in various parts of the area? In what ways can the Commission seek to be of assistance to territorial administrations in this field? These are among the more important questions that will be considered at the Technical Meeting on Co-operatives to be held under Commission auspices at Port Moresby from July 21 to August 2.

By RICHARD SEDDON*

MONDAY July 21 will see the formal opening by His Honour the Administrator of the Territory of Papua and New Guinea of the Commission's technical meeting on co-operatives at Port Moresby. The following two weeks will be devoted to a thorough consideration of the agenda which has been approved for the meeting.

Co-operatives officers from many Pacific territories, together with territorial administrative officers, observers from some metropolitan governments and from the United Nations Food and Agricultural Organization, and Commission officers will together undertake a series of discussions aimed at providing an assessment of the practical value of co-operatives in territorial development as well as providing an opportunity to consider in some detail techniques connected with the formation and guidance of co-operative societies.

Running through the discussions, as it were, will be the careful appraisal of the various ways in which the Commission's help can be useful to territorial administrations in connection with their responsibilities for co-operative activities.

Not the least value of such a meeting is, of course, the bringing together of officers with a wide variety of territorial experience to exchange views and to discuss their problems, and one may safely hazard the prediction that much of the discussion will be outside the actual place of meeting, and informal rather than otherwise.

Full Role Of Co-operatives In Pacific Development

In considering an appropriate agenda for the meeting the Commission has been concerned to see that the important interrelationships that can exist between the co-operative movement and territorial development are not obscured by a narrowly technical approach. That is why the agenda stresses consideration of the place and practical value of co-operative organization not merely as another economic form, important though this may be, but rather in relation to the all-round advancement of the South Pacific peoples.

It is, for example, already widely recognized that the co-operative form of organization is a most important means by which the attitudes of self-help and local initiative may be encouraged, attitudes which are essential if the necessary social conditions for full development are to be within reach. Nor are these the only social gains, for par-

* Executive Officer for Social Development, South Pacific Commission.

Co-operation in the Cook Islands. Checking accounts before a meeting of the Titikaveka Thrift and Credit Society.

ticipation in co-operative enterprises provides admirable opportunities for training in democratic procedures and in the application of self-governing principles so important in the proper establishment and functioning of local authorities.

Another aspect of the subject that will require to be carefully examined is the rôle of government towards co-operatives, for it seems reasonably clear that where conditions of inadequate knowledge of the basic principles of co-operation, lack of leadership and initiative have to be contended with, government has a responsibility to provide the necessary assistance and guidance without prejudice to the important voluntary ingredient. The ways in which this might most usefully be done, the extent to which various forms of assistance might be provided, and the experience of the South Pacific territories in this and related matters are sure to provide a focus of discussion in which administrative officers will be prominent.

It is within this larger context of territorial social and economic development that the usefulness of particular types of co-operative organization will be considered — thrift and credit societies, school co-operatives, production and marketing groups, and the like. On these topics, as well as on others included in the agenda, working papers have already been prepared by those who will participate in the meeting so that the actual time of the meeting will be able to be devoted to those aspects of the various topics calling for careful and detailed consideration.

Particularly useful discussion should be stimulated by the topic "co-operative community development" which opens up the field of aided self-help as an approach to the whole range of objectives covered by economic development and social betterment, and comprises a combination of all those methods by which the efforts of the people are joined with those of agencies of government and of voluntary agencies to promote their economic and social well-being. It is perhaps within such an approach as this that co-operation finds its proper setting, with its special emphasis on the fuller participation of the people with as much reliance as possible on their own expanding initiative, supported by the provision of co-ordinated technical and other services by government.

Such, then, is the general framework within which the technical meeting on co-operatives will proceed. If, as a result, a thoroughly practical assessment of the rôle of government co-operative services in advancing territorial development is an outcome, its holding will have been well worth while.

CO-OPERATION IN THE ISLANDS

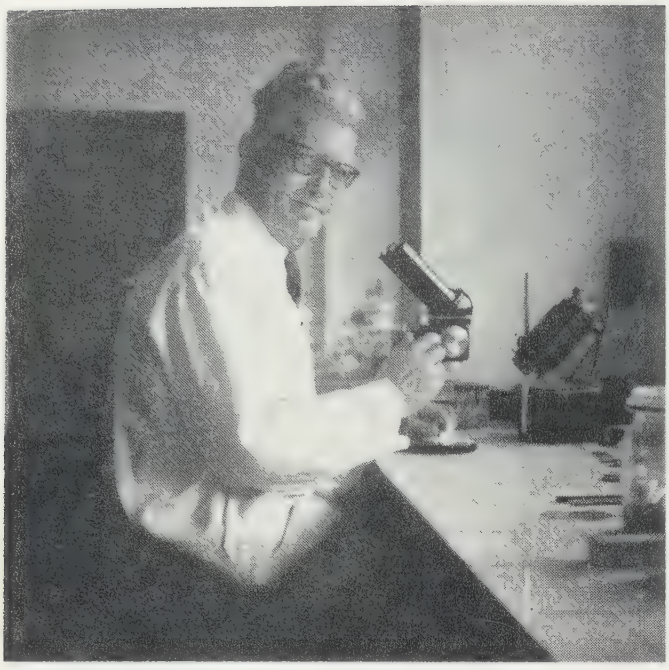
To the Pacific islander the idea of co-operation is not new; it is part of his way of life. Through the centuries he has carried out well-organized co-operative activities such as those illustrated on this page. Above: Trobriand Islanders build a canoe; below, Fijians take part in a fish drive.

SPC To Hold Fourth South Pacific Conference In New Britain

OVER seventy delegates from nineteen Pacific territories are expected to attend the fourth South Pacific Conference, which will be held next April at Malaguna, near Rabaul in New Britain.

During June the Secretary-General of the South Pacific Commission, Mr. T. R. Smith, visited Papua and New Guinea to inspect the conference site and to confer with Administration authorities on arrangements for the meeting.

The South Pacific Conference is an auxiliary body of the Commission, providing a direct link between it and the Pacific island peoples it serves. The first Conference was held in Suva in 1950, the second at Commission headquarters in Nouméa in 1953, and the third in Suva in 1956.



Left: Dr. Renaud Paulian, Assistant Director of the Institut de Recherche Scientifique de Madagascar, at work in his laboratory in Tananarive. Dr. Paulian, an entomologist famous for his years of study of the unique fauna of Madagascar, is directing the rhinoceros beetle project of the Institute and assisting with the technical details of the research. Above: M. Jean Lepointe, Scientific Officer of ORSTOM, assigned to carry out the investigations on the Madagascar species of rhinoceros beetles, examining breeding places of Oryctes in the native forest near Perinet, Madagascar.

SPC Sponsors Rhinoceros Beetle Campaign In Madagascar

A new attempt to discover a control for the rhinoceros beetle in the South Pacific began last January with the launching of a Commission-sponsored investigation in Madagascar.

By CHARLES P. HOYT*

LAST January the *Institut de Recherche Scientifique de Madagascar* began full-time investigations of the factors affecting the lives of the various native species of rhinoceros beetles of the genus *Oryctes* found in Madagascar. This project was made possible by a grant-in-aid of £stg.3,000 from the South Pacific Commission to the *Office de la Recherche Scientifique et Technique Outre-Mer,* an organization which maintains the Madagascar institution and similar scientific institutions in various overseas territories of France.

It is hoped that as a result of this research project undertaken by the IRSM, specific parasites and predators will be discovered which, when introduced into the South Pacific area will effectively control the coconut rhinoceros beetle, *Oryctes rhinoceros.*

Dr. Renaud Paulian, Assistant Director of the Institute, and famous for his years of entomological work in Madagascar and Africa, is directing the project and is giving generously of his time to handle the many problems of identification and compilation of data pertaining to the numerous native species of rhinoceros beetles, their distribution, parasites and predators.

M. Jean Lepointe (Scientific Officer of ORSTOM), who had previously been working for several years in French West Africa on insect pests of agricultural crops, has been assigned to the Institute by ORSTOM for the specific purpose of carrying out this research. He and two assistants are working full-time in the field on this project.

The senior assistant, M. Eugène Razafimandimby, has been employed by the Institute for the past ten years in its entomological laboratories and, in addition, has taken active part in several expeditions into the remote areas of Madagascar.

The second assistant, M. Jean Elie Randriamasy, is an experienced collector employed by the Institute and has been on numerous zoological expeditions in Madagascar, the last of which was to accompany Dr. and Mrs. Petter during their 1956-1957 survey of the ecology of the Lemuroidea.

This team commenced its work in the native forest area in the vicinity of Perinet. Here several species of rhinoceros beetle are to be found feeding on native palms under conditions unchanged for centuries. It is thought that in this natural environment the controlling factors such as parasites and predators will be easily discovered and their life histories and relationships to their hosts can be studied without the environmental complications inherent in the highly-cultivated areas. Later, the investigators will follow the biological complex associated with the various rhinoceros beetle populations into the cultivated areas to observe the changes which take place under these conditions.

Madagascar is of exceptional interest to entomologists concerned with the search for natural enemies useful in controlling the coconut rhinoceros beetle (*Oryctes rhinoceros*) because of the large number of closely-related species inhabiting this island which are apparently being held in check by natural means. The discovery of these natural enemies, the study of their roles as controlling agents, and finally the collection of the most promising and their eventual establishment on those Pacific islands infested with the coconut rhinoceros beetle will, it is hoped, bring a successful conclusion to this part of the South Pacific Commission's programme to control this pest of the coconut palms, which are so vital to life in the region.

* Technical Officer, Pests and Diseases, South Pacific Commission.

Nicotiana fragrans, a wild relative of the cultivated tobacco. During his latest field trip Dr. Barrau collected seeds of this plant in Mare Island, in the Loyalty Group.

Fruit (above) and bunch (right) of a wild seeded banana, Musa acuminata, found by Dr. Barrau near Manokwari, on the north coast of Netherlands New Guinea.

Plant Introduction Officer Makes Field Trip Through Melanesia

Between January and July the Commission's plant introduction officer, Dr. Jacques Barrau, visited Netherlands New Guinea, Papua and New Guinea, the British Solomon Islands, and the Loyalty Islands. Below, he gives a brief account of his field trip, concluding with a note on latest progress made in the Commission's plant introduction programme.

THE main purpose of this field work was to complete a survey on the economic flora of the territories visited, mostly on what concerns the cash and subsistence crops.

Special attention was paid to the species and varieties of coffee and cocoa present in New Guinea, which appear to be a potential source of very valuable plant material. The collection of coffee and cocoa species already assembled at experiment stations, both in Netherlands New Guinea and Papua and New Guinea, is fairly important.

Additionally, the outstanding coffee and cocoa selection work in progress at Keravat Lowlands Agricultural Experiment Station, New Britain, will certainly result in the release of excellent material for the development of these two cash crops.

Material Collected

Material collected during this field trip comprised:

FROM NETHERLANDS NEW GUINEA: Cuttings of varieties of sweet potato *Ipomoea batatas* grown in the Baliem Valley, central Highlands of Netherlands New Guinea; seeds of wild bananas *Musa acuminata banksii* and *M.* aff. *lolodensis* growing in rain and riverine forests near Manokwari.

FROM PAPUA AND NEW GUINEA: Seeds of the taro *Colocasia esculenta*, which were sent to Dr. R. C. Cooper, botanist at the Auckland Institute and Museum.

FROM THE LOYALTY ISLANDS: Seeds of *Nicotiana fragrans*, a wild relative of the tobacco found only in certain islands of the South Pacific (New Caledonian Archipelago, Tonga, and the Marquesas Islands); suckers of the banana species *Musa discolor, M. fehi* and *M. sapientum* var. *oleracea*.

The banana-planting material was sent to Dr. N. W. Simmonds, cytogeneticist of the Imperial College of Tropical Agriculture, Trinidad, and the *Nicotiana* seeds to tobacco breeders of the C.S.I.R.O., Canberra, to the United States Department of Agriculture, Washington, and to the French *Institut de Recherches de Tabacs*.

The seeds, cuttings and suckers were collected and sent outside our area in exchange for economic plant material requested or already received from overseas sources.

In the case of the sweet potato, following a request of the Netherlands New Guinea Department of Agriculture, cuttings were collected in the Baliem Valley for inclusion in the sweet potato varieties collection of Kota-Nica Station for selection purposes.

Latest SPC Plant Introduction Activities

Many requests for plant introduction have been received since the beginning of the year.

Among latest accessions one may quote several varieties of *coffee arabica* and *C. canephora* var. *Robusta* from the United States Department of Agriculture station in Beltsville. This material has been added to the collection of the coffee propagation station of the Department of Agriculture in New Caledonia.

Introduction of "Arabica" and "Robusta" coffee varieties is also being arranged for the Departments of Agriculture of the British Solomon Islands, Fiji, and Netherlands New Guinea.

The last-named territory has requested Commission help in introducing "Lafi 7" cocoa planting material. This is being done with the assistance of the Kew Royal Botanic Gardens in England, where the material is now quarantined under strict control of pathologists and entomologists.

In addition, a fairly large number of seeds of legumes species useful as cover plants, maize, sorghum and rice varieties, castor-beans, etc., have been sent on request to several territories.

A detailed account of these activities will be given in the next issue of the *Quarterly Bulletin*.

Aided Self-Help On Niue Island

By combined effort the people and Administration of Niue Island have made roads, installed village water tanks, and built schools and community centres. How these and other aided self-help projects are planned and carried out is related in this article . . .

By A. O. DARE*

Villagers erect a circular mould of corrugated iron into which they will pour concrete to form the base of a new water tank.

ON Niue Island, every effort is made to give the people a feeling of participation in planning for the island's development. Frequent village meetings with them by officers of the Health, Agriculture and Education Departments as well as the Resident Commissioner help to bring them into the picture, while Island Councillors are kept fully informed and from time to time make tours of works projects. This sense of participation has led to co-operation, and consequently to many aided self-help projects.

Erection Of Water Tanks

The erection of water tanks provides perhaps the best example of the latter. There are no rivers, streams or lakes on Niue, and except for a well over 180 feet deep all water is collected from catchments into tanks. During the last twelve months the people and Administration have by combined effort built tanks to a total capacity of 221,000 gallons.

Two types have been built, one, part underground, of reinforced concrete poured into boxing, the other a slab tank imported from New Zealand and assembled on the spot. For the former, the people of the village where it is to be built dig a hole, gather rock for carting by Administration vehicles to the site, feed an Administration-owned mobile crusher, mix the cement and pour it. The Public Works Department supplies skilled men to show the people how to put in the boxing and reinforcing, and plumbers to install the spouting and down pipes.

When erecting a slab tank, villagers first gather rocks at the roadside. On a selected Saturday a Public Works Department overseer takes the mobile crusher to the site, where in one day the people collect the rocks in Administration vehicles, crush the chips, and lay the foundation. Under the guidance of the foreman the tank is assembled a few days later by the people. The following Saturday they put down the floor and seal the joints.

For the catchment, a gang of villagers goes to the bush on a Saturday, fells trees, takes them to the Administration sawmill and cuts them to the needed sizes. The timber is then delivered to the tank site with sufficient iron for the job. A carpenter can usually be found in the village to supervise the erection. If he works for the Administration he usually takes a few days off without pay for the purpose. (Quite often, if a village is erecting a tank or undertaking a job of any size, most employees of the Administration who come from that village will ask for time off without pay to assist on it).

The use of pre-cast slabs for tank building greatly fosters co-operation from the people, for once the foundation ring is poured, they can erect a 10,600 gallon tank in under two hours and thus see something immediately for their efforts. It then needs only another few hours' work to plaster the bottom and seal the sides.

New Schools Being Built

During the past eighteen months new primary and post-primary schools have been started. They share the same site, which was originally covered in bush and jagged coral. The people from each of the fourteen villages on the island have made several voluntary excursions to the area and have assisted considerably in levelling it off. Usually at least one hundred men and women take part in the day's work.

This co-operation followed explanations of the purpose of the schools, the costs involved and the desire of the Administration to further the education of the youth of the island. The people now feel they have a stake in the schools, and later on there should be little difficulty in forming parents' committees to help run them.

Councillors visit this project from time to time and note progress in the buildings and site levelling. They have an appreciation of the cost of materials and labour being supplied by subsidy from the New Zealand Government, and are only too keen to participate in the programme.

Small Projects An Encouragement

We have found it useful to undertake some projects which, though small, produce immediate tangible results. The people can readily appreciate their value, and this has in consequence led them to volunteer considerable self-help in major undertakings.

For example, people of the village of Liku had always found it difficult to take their canoes down the cliffs to the sea. However, it only required a little guidance, explosive and cement to enable them to construct an easy pathway. This meant a great deal to their welfare, and almost everyone worked with a will. Since then these people have co-operated readily in supplying free labour to build two tanks, for their village and school.

* Resident Commissioner, Niue Island.

Island Councillors outside a new house in Vaiea village, following an inspection of various aided self-help projects in course of completion there.

For many years the people of Mutalau village have wanted a hospital, but it has been, and still is, impractical to provide one for them. Two evening meetings enabled the reasons to be given, and there was little difficulty in effecting a compromise to build a dispensary under a water catchment. An explanation that limited medical supplies could be held for use by the visiting medical staff and the clinic sister met with appreciation, and both men and women turned out to complete the tank, catchment and dispensary.

The dispensary follows the typical Niuean style of building. The spaces between the framing were filled with *fitifiti* (woven sticks) and then the whole was plastered on both sides with *puga* (burnt coral). The result is a neat white plastered appearance.

Here the people cut the logs, the Administration milled them and the people erected the dispensary.

Villages Kept Clean

If the people understand the need for public health programmes there is little difficulty in obtaining village assistance in cleaning up activities. Quite recently the people of Makefu village spent the day cleaning through the bush near the hospital. Such assistance not only does much to keep down flies and mosquitoes but it encourages villagers to keep the surroundings of their own homes tidy.

Again, while a local ordinance requires people to clean road frontages quarterly, there is now little problem in getting this done, for the people have developed a pride in the appearance of their island. On any occasion, as for example for the visit of some notability, the people will whitewash their homes inside and out and clip the grass around them and on the village greens. They need no urging; in fact, following a recent official demonstration of a motor mower, one village immediately placed an order for a machine.

People Help With Road Programmes

Road work is a major task on Niue, for there are eighty miles of formed roads to be maintained. An effective contract system operates. Whenever repairs are required in an area the village concerned is asked to supply truck loads of rock and *makatea*—or coral sand—at 7/- and 8/6 a truck load respectively. The village loads the trucks as a community effort and roading costs are kept at a reasonable level. The village gains by better roads and the financial reward.

Again, roads to give access to planting land have been considerably improved under a scheme whereby the people in the locality give voluntary labour while the Administration provides trucks.

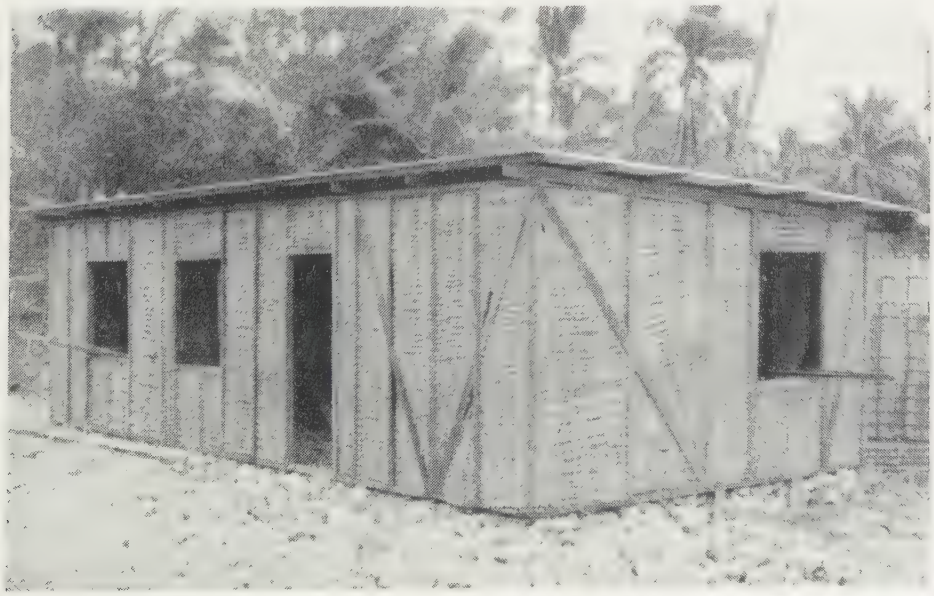
Homes By Aided Self-Help

Housing is an important aspect of Niuean life. Over the years Niueans have become house proud, and they are prepared to save over long periods to build a home very close to normal European standards. The interest shown in housing activities by senior Administration officers, and the help they are ready to give builders needing it in matters of design and methods of construction, have done much to foster this outlook, which has been further encouraged by the various savings and credit schemes operating on the island.

Iron and cement for both housing and water tanks are sold at landed cost to encourage better housing and water supplies. Tractors are available for hauling logs from the bush, and a sawmill for milling the timber, though the people still often adze most of their requirements themselves.

People Supply Logs For Amenities

A recent survey of latrines in part of one village showed the need for considerable improvement. Following several



The water catchment and dispensary being built at Mutalau village. Lathes woven into the frame will be later plastered on both sides with burnt coral.

village meetings a project is now under way whereby the people will build new latrines, paying for all materials by supplying logs to the Administration sawmill.

Similarly, the same village wishes to buy a village truck. The people have a credit of over £200 and propose to find the balance by selling trees to the Administration. By making arrangements such as this, permitting the people to help themselves, they achieve an objective by their own efforts while at the same time the sawmill acquires a reserve supply of logs.

Two Community Centres Built

A little guidance and financial assistance have paved the way for the erection of two community centres. The people have collected quite large sums of money, and by voluntary labour now have two halls, complete with louvre windows.

They are at present used as meeting places for the Clinic Sister, the Councillor, Chief Medical Officer, Agriculture Officer, and other Administration officials, and as well serve as theatres, dance halls and venues for village welcomes and farewells. There is no reason why they cannot now develop into library centres, centres for promotion of native arts, and so on.

The main thing is of course that both have been built by the people themselves —with some advice and a little financial help from the Administration—and as such are regarded as tangible achievements, so that we can expect further development within them. The people now need only a little further advice on the organization of suitable committees to promote better living.

Voluntary Welfare Work In Hospitals

An understanding of the benefits of a good medical service has led some villages to assist in hospital welfare. From time to time people from a village will seek permission to visit the patients, sing some hymns and leave a cash donation. These visits have brought pleasure to patients, not only on the day of the visit but from the presents for adults and children bought out of the money.

Youth Movements Popular

An interest in youth movements has resulted in the formation of scout troops and boys' clubs. These, along with the Boys' Brigade and other similar church groups, mean a lot in the promotion of healthy living among youths. The giving up of spare time by the leaders is inevitable, but the interest shown by the people makes it worth while.

Last New Year's day a few active people decided that an island sports meeting, with canoe and foot races, would be a useful project. It was a complete success, and now an island committee will arrange two meetings a year.

The Niuean is a hard worker, and as long as he can see the sense in a project he will do his part if he is shown the way.

Aided Self-Help Opportunities Unlimited

The opportunities for "aided self-help" in most island communities are unlimited. However, in "aided self-help" programmes it must always be remembered that for success the people must have complete confidence in their leaders. It should also be remembered that in the desire to improve material standards, it is equally necessary to take into account the spiritual, social and cultural elements and to provide for their parallel development.

Coconut Trees In The Philippines Threatened With Total Destruction

IN 1928, an unknown disease appeared in a coconut plantation of San Miguel Island in the Philippines. At the time, no-one ever dreamed that this disease was going to destroy, in the course of the next 25 years, the whole of 250,000 coconut palms of the island. Even less was it thought that the disease would spread to Luzon, the main island in the archipelago, and affect the plantations throughout four provinces in the Bicol area.

The disease was named "cadang-cadang"—from the Bicol word "to die" —because it kills the palm and causes the lower leaves to turn brown and fall. It is known in English as "yellow mottle disease".

In 25 years it has spread to the provinces of Albay, Sorsogon, and the North and South Camarines. In the north of the island, the provinces of Quezon, Batangas, Laguna and other coconut producing areas are also threatened. The disease will spread at a rate which depends entirely on the results of research being carried out with a view to slowing down or halting the infection.

Millions Of Palms Infected

Since 1951 the Experimental Station at Guinobatan has been investigating the propagation of "cadang-cadang". Each year a census of healthy and diseased palms is taken on 20-yard strips of land selected on plantations dotted along the roads in the Bicol area. Using these figures as a basis to estimate the spread of the infection, and taking into account the total palm population reckoned at the time of the national census of 1948 (16,500,000 coconut palms in the Bicol area) it is considered that the number of diseased palms totalled 1,788,000 in 1951; 4,569,000 in 1952; 5,527,000 in 1953; 6,030,000 in 1954; 6,307,000 in 1955 and 7,927,000 in 1956.

Normally, the coconut palm produces 70 nuts a year. The present market price is 6 centavos per nut; the crop from one palm is therefore worth P.4.20 (approximately £stg.0/15/4). Contaminated palms die very rapidly. They soon become barren, and as in 1956 there were 7,927,000 diseased palms, the total loss for that year has been estimated at P.33,293,000 (approximately £stg.587,347).

If "yellow mottle disease" continues to spread at the same pace, all the coconut palms in the Bicol area will have vanished by 1964—less than seven years from now!

If the disease cannot be halted, in 1964 growers will suffer a loss estimated at P.69,000,000 (approximately £stg.1,232,142).

Research has indicated that the disease does not always spread from one palm to another. In some cases, a diseased palm contaminates its next-door neighbours, in other cases, palms fairly remote from the diseased specimen are attacked. This discovery seems to indicate that the disease is not transmitted through the roots, but rather through the air flow—wind and insects.

It has been suggested that the disease is caused or carried by typhoons. However, experience has proved that many a typhoon has hit the Philippines without bringing "cadang-cadang" in its wake. Another theory is that the trouble is caused by root decay; there again, the fact that the disease does not affect palm after palm in any one row does away with the possibility of "cadang-cadang" being a root disease. It has also been considered that yellow mottle disease is caused by a fungus, bacteria or nematodes attacking the leaves. However, none of these has been found to be closely associated with the disease.

"Cadang-cadang" has also been detected on plantations abundantly fertilized with superphosphates or mineral salts containing micro-elements—zinc, copper and boron—thus doing away with the theory that the disease is due to a deficiency in the soil.

"Cadang-cadang" Probably A Virus Disease

"Cadang-cadang" is most probably caused by a virus. Its symptoms are very similar to those of other well-known virus diseases; the way in which the disease spreads appears to follow the pattern of infection of virus diseases carried by insects. But the proof that insects are the vectors will be difficult to establish. There are, at least, a hundred varieties of insects living on coconut palms. Each species will have to be

(Continued on page 29)

Members and specialist consultants who attended the ninth meeting of the Research Council, photographed outside Commission headquarters in Noumea. Front row (l. to r.): Mr. W. C. Groves, Mr. T. R. Smith (Secretary-General), Dr. J. V. de Bruyn (Chairman), Miss F. H. Gwilliam, Professor H. Belshaw, Mr. H. de Young. Back row (l. to r.): Mr. C. H. Allan, Mr. J. L. Noakes, Dr. A. H. J. Kroon, Dr. E. Massal, Dr. Richard Seddon. Miss Gwilliam and Professor Belshaw attended the meeting as specialist consultants.

SPC Research Council Holds Ninth Meeting

By RICHARD SEDDON*

THE ninth meeting of the Research Council of the South Pacific Commission was held at the headquarters of the Commission at Nouméa, New Caledonia, from May 17 to 28, 1958, under the chairmanship of Dr. J. V. de Bruyn, Adviser for Native Affairs, Hollandia, Netherlands New Guinea.

This was the first meeting of the Council to be held under the revised conditions adopted by the Commission at its seventeenth (1957) session, which provide that while the Council continues to include eighteen appointed members, in any one year only six of those members, each with particular knowledge of the field of concentration to be considered, may be asked to meet, together with other members appointed as consultants and with those officers of the Commission staff who are members of the Council.

This year the social development programme was the principal subject for consideration, with special attention given to the subject of aided self-help and to the women's interests project.

In its discussions of these matters the Council was greatly assisted by the two

(Continued on page 33)

* Executive Officer for Social Development, South Pacific Commission.

NINTH RESEARCH COUNCIL MEETING: Participants and Observers

Members

Mr. C. H. ALLAN: Acting Secretary for Protectorate Affairs, Honiara, British Solomon Islands Protectorate.

Dr. J. V. de BRUYN, Adviser for Native Affairs, Hollandia, Netherlands New Guinea.

Mr. W. C. GROVES: Director, Department of Education, Port Moresby, Territory of Papua and New Guinea.

Professor J. GUIART: Professor of History of Oceanic Religions at the Practical School of Advanced Studies of the Sorbonne, Clamart (Seine), France.

Dr. A. H. J. KROON, Executive Officer for Economic Development, South Pacific Commission.

Dr. E. MASSAL: Executive Officer for Health, South Pacific Commission.

Mr. J. L. NOAKES: Director of Social Development, Rarotonga, Cook Islands.

Dr. RICHARD SEDDON: Executive Officer for Social Development, South Pacific Commission.

Mr. T. R. SMITH: Secretary-General, South Pacific Commission.

Mr. John de YOUNG: Staff Anthropologist, Trust Territory of the Pacific Islands, Agana, Guam.

Specialist Consultants

Professor H. BELSHAW: Macarthy Professor of Economics, Victoria University of Wellington, New Zealand.

Miss F. H. GWILLIAM: Woman Education Adviser, Colonial Office, London.

Observer

Professor J. W. DAVIDSON: Dean, The Research School of Pacific Studies, The Australian National University, Canberra, Australia.

Re-Planting Old Coconut Land

The average age of coconut palms in the Pacific is seldom less than forty years, often as high as sixty. In an article in the January QUARTERLY BULLETIN *Mr. D. R. A. Eden stressed that unless the re-planting of old coconut areas were not undertaken soon in many island groups, a serious decline in Pacific copra production within the next decade or two appeared to be inevitable. In the article below, he describes the re-planting procedure which proved successful on the plantations he directed for many years in Western Samoa.*

By D. R. A. EDEN*

Throughout the Pacific the number of old plantations long overdue for re-planting such as that pictured above is steadily growing.

THE planting of virgin land is, of course, the surest way of gaining optimum results from any permanent crop. Nevertheless, many old coconut estates contain good alluvial coastal flats and fertile valleys in higher altitudes where only the age of the palms, and not soil exhaustion, is responsible for a declining production. There is no reason why such areas could not be re-planted with confidence.

In some cases a certain amount of soil rehabilitation may be necessary, and the following notes on a pilot project in re-planting an area of unusually old palms in Western Samoa may be found of interest.

The re-planting trial was commenced at Vailele Plantation as long ago as 1932. When the new palms in the re-planted area arrived at full maturity in 1946 it was found that production had been increased from less than five hundredweight to just over one ton of copra to the acre, dry weight.

The section chosen for re-planting contained an area of 88 acres which had been partly planted by a German plantation and trading company in 1864, and also contained what was originally a native grove of coconuts. The latter, at the date of re-planting, were estimated to be close to one hundred years old.

Some patches in the block were bare of coconuts where the palms had died of old age and rhinoceros beetle attack, and because cattle were grazed under the palms and kept the grasses low, lack of any shade in the bare patches caused leaching of humus in the soil there. The ground, composed of a coarse grained laterite of weathered lava formation, had been pugged hard by the grazing of cattle over many years.

Natural grasses were confined principally to a local "carpet" grass *Axonopus compressus* and the "sensitive plant" *Mimosa pudica*. The stock, however, thrived on this fodder combination, while the Mimosa, being a legume, supplied a modicum of nitrogen to the soil. Analysis showed what may be expected in old coconut land anywhere, a potash deficiency.

The first problem for the management to decide was whether to remove all the old palms which were still bearing small crops and sacrifice whatever income they provided, or to re-plant in new lines among them. Nut-fall from the old trees in the case of the latter choice could be harvested while the new palms were coming into bearing.

There were other considerations, too. The cutting down of the aged coconuts and the disposal of some four thousand solid fifty-foot palm trunks posed a particular problem in Samoa. If dumped on any part of the plantation they would serve as an ideal breeding ground for the rhinoceros beetle. If they were to be burned, the stems would have to be cut into lengths that could be handled, and even then such a vast number would be difficult to burn. Lastly, if they were to be dumped into the salt water somewhere, transport and handling would be expensive, and beach litter a probable complication.

I remember that the final consideration in the decision to retain the old coconuts was the fact that the adult rhinoceros beetle is prone to attack palms growing in light open spaces rather than in shaded groves. It was believed that the canopy of shade provided by the old palms would tend to protect the young re-plants and minimise beetle attack. This theory proved correct, and with the help of split-log traps around the boundary and regular searching for larvae and adults, the young plantation was brought to maturity without damage by the pest.

The old palms continued to die and had to be removed, but this process was conveniently spread over years. With only a few stems to cope with at a time they were easily disposed of by felling, chopping up and transporting them to the driers. There they were burnt with the aid of surplus husks.

Surprisingly little damage was done to the new plantation by felling. Little or no crown remained on the old trees when they died, and the stems were made to fall between the young palms. In some

* Mr. Eden, who is a leading authority on coconut cultivation in the Western Pacific, was General Manager of the New Zealand Reparation Estates in Western Samoa from 1935 until his retirement in 1956.

cases, as a dead palm was felled, a taut wire rope from a "Forest Devil" winch anchored to a convenient live palm butt with the pull in the direction required, added further control to the fall.

Before re-planting began, a nursery had been established for growing coconut seedlings from selected nuts. This was extended as the nuts were selected to hold about five thousand young plants.

The nursery had been ploughed as deeply as possible, while beach sand had been added to the top soil in heavy quantities and forked in. This ensured a friable medium for the subsequent easy removal of the rootlets of the seedlings. The experienced planter knows that irreparable damage can be done to young palms if they are carelessly torn out of a nursery bed and their primary roots damaged. In such cases the work of careful selection is virtually wasted.

Healthy mother palms with well-balanced and well-foliated crowns, carrying heavy crops of good-sized nuts, had been selected on all parts of the estate, and these were marked with tarred bands. None were chosen near stockyards or driers, where pen manure or drier compost would foster abnormal growth and bearing. Such artificial qualities are unlikely to be transmitted to their progeny.

Coconuts were collected from the mother trees and upon arrival at the nursery were sorted and all under-sized or mis-shapen nuts rejected. Nuts of the usual ovoid shape but with rounded bulges at their centre circumference were favoured, as this feature generally denotes generous endocarp formation within.

The nuts were planted on their sides with the wide segment containing the growing eye down and about six inches apart in the nursery seed beds. Care was taken to see that the nut was 50 per cent. above the soil. Pests and diseases are harboured in the perianth depression if the nut is buried too deeply.

There have always been two schools of thought among planters as to whether seed coconuts should be placed upright in the soil or laid on their sides. The arguments against upright planting are, firstly, that when a nut falls from a coconut palm it comes to rest on its side and natural germination and growth takes place in that position; secondly, that the rootlets are given faster access to the soil when a nut is placed on its side, for when planted on end they have to push their way through the husk fibres before emerging to find the ground; and, thirdly, that the depression at the perianth or growing end, being uppermost, collects rain and remains damp, fostering fungus disease development.

Those that advocate upright planting point out the ugly right-angled bend that the growing shoot of a side-planted nut must take to achieve the perpendicular! I can only add that I have seen them planted both ways, and have been unable to find that it makes any appreciable difference to subsequent growth or bearing which way they are planted.

Fijians planting selected seed nuts in a coconut nursery.

Reverting to the nursery. Selection work continued after the nuts germinated, seedlings showing lack of vigour and those having malformed primary leaves being rejected.

The next important work was that of rehabilitating the soil in the 88 acres to give the young palms every encouragement for growth when they were planted out. Humus restoration was of paramount importance, since muriate of potash could be applied as an artificial fertiliser to correct the potash deficiency.

Green manuring is the only economical way open to the planter for restoring humus over large areas. It consists either of raising quick-growing herbaceous plants as a temporary crop for ploughing in, or, more permanently, by the use of leguminous creepers or plants.

The detritus formed by leaf-fall and/or loppings from a legume become a natural source of compost, while the root action of these plants improve the mechanical condition of the soil. Beneficial bacteria congregate in and around the root nodules usually found on a legume, and establish a supply of nitrogen which becomes available as a plant food.

For the pilot project a quick-growing leguminous vine was required as a cover crop. A wide choice lay open, but the most favoured were those which had already been successfully grown on the Estates. These were *Calopogonium mucunoides*, *Pueraria hirsuta* and *Centrosema plumieri*. Because of its phenomenally rapid growth and dense cover the *Calopogonium* was selected.

The land was ploughed by the use of a tractor and multiple disc plough, the average depth of the first ploughing being six inches and eight inches in the second. It was left to fallow for a fortnight between the two ploughings, the object being to give the turned sod an opportunity for maximum sun and air absorption. This would tend to kill spores or soil fungus diseases and would promote favourable conditions for the oxidation of organic matter in the ground.

The ploughings were double run; i.e., ploughed lengthwise along the old palm lines, and then across at right angles to the first furrows.

Two weeks after the second ploughing was completed, the *Calopogonium* seed was sown broadcast at the rate of 25 lbs. to the acre.

Lining out and hole digging followed. The old trees had been planted 30' x 30' apart, so the new lines were run down the middle of the lanes formed by the old ones. The holes were dug at the cross of diagonal lines between four old trees. Where the old native grove had been haphazardly planted, the new lines continued straight through. The holes were dug two feet by two feet with a depth of two feet.

Where sub-surface stone was encountered, holes were bored and a plug of gelignite exploded.

H. F. Macmillan in his publication

Bad overcrowding of palms in this plantation is a fault that should be corrected on re-planting.

Tropical Planting and Gardening advocates the use of explosives where "a hard sub-stratum is to be made penetrable to the roots of plants, allowing for the free percolation of water and liberating essential elements of plant food. . . . Dynamiting is especially beneficial," he states, "in the planting of trees, the hard bottom of the holes being thus well broken up."

For record purposes the palms in the dynamited holes were marked with painted metal stakes, so that comparative development could be observed. Only in the third and fourth years did the palms in the exploded ground appear to make more vigorous growth than their neighbours in the hand-dug holes. Thereafter no progress above average could be observed. It was felt, however, that had the palms been grown in the hard bottom areas without the help of explosives, their growth could possibly have been below standard.

This was proved to our satisfaction where a second re-planting scheme was undertaken on a hillside slope with a fairly extensive hard bottom area. A number of palms was left with the hard sub-stratum intact; these were marked as before. After the fourth year the palms in the unexploded holes became noticeably inferior to their neighbours, and remained so to maturity.

In subsequent re-planting operations, notwithstanding the extra cost, explosives were used wherever the nature of the sub-soil appeared to warrant it.

Care was taken with the removal of the topsoil as the holes were dug. It was heaped for easy identification on the eastern side of each pit. In this way it was returned to the top when the holes were re-filled. Thus the young seedlings had the benefit of the best soil around their rootlets as they reached out for establishment.

Any available vegetable matter such as old husks and fallen palm fronds were collected and thrown into the bottom of the pits. The holes were kept open to expose the excavated soil to the sunlight and air until all the digging was completed.

The sub-soil was first replaced, but before the top soil was put on, fertilizer was added to the bottom layers. This was a mixture of "the big three", superphosphate, sulphate of ammonia and muriate of potash in proportions of 3, 2 and 1 by weight. One-and-a-half pounds of the mixture was applied to each hole. Finally, after each seedling had been planted, the soil surface was heavily sprinkled with fertilizer. It is not considered good practice to allow raw fertilizer to come into direct contact with the tender rootlets at planting time. When it is surface spread, the next rains carry it down in less harsh liquid form.

Cattle were excluded from the area until the fronds of the young trees were out of reach, a matter of five or six years. This enabled the *Calopogonium* to flourish undisturbed. The vines renewed themselves by seeding, their leaf-fall and old decaying stems formed a natural compost and the vines an excellent mulch.

Collecting the coconuts from the old bearing palms proved difficult, and growing nuts from those lost among the vines were plentiful.

The young palms maintained vigorous growth and came into bearing with small crops in the sixth year. Maximum production was not attained until the fourteenth year, when just over a ton of copra to the acre was recorded.

It may be argued, and rightly so, that the old palms which had been left in the field contributed to the total harvested. By the fourteenth year, however, there were not a great many of the old ones left, though what there were had been noticeably rejuvenated by the action of the cover crop and several applications of fertilizer. It is doubtful, however, if the old palms contributed in 1946 more than a hundredweight or two to the acre.

Subsequent re-plantings followed the same methods employed on the pilot project, except in cases where old age and beetle attack had left so few of the old palms that their pest-ridden crowns offered only a threat of infection to the new plantation. In such sections the old trees were eliminated by being pushed over by the use of a bulldozer—roots, stumps and all.

It had been found that old roots and stumps left in various parts of the plantation became, as they rotted, a favourite breeding-ground of the rhinoceros beetle, particularly among the damp decaying roots. In badly-infested areas their complete removal was a blessing, but their disposal became a problem. It was solved by employing the bull-dozer to push all the logs and stumps into great heaps well over at the edge of the sections, where, by the use of bush tree firewood and with loads of husks they were gradually burnt. The heaps could be left partly burnt for months without fear, because the carbon-coated and very dry coconut wood offered no attraction to the beetle pest.

In some more recent instances, when our re-planting programme exceeded the scope of our nurseries and only nuts and not seedlings were available, the seed nuts were planted in the field, *in Situ*, after holes had been prepared in the manner already described. This complicated the work of rejecting seedlings showing inferior growth and added to costs.

Perhaps I should add, for the sake of newcomers to planting, that results obtained from selections from the best plantation mother trees do not necessarily come up to expectations. The mother palms may produce nuts which are the results of hybridization in the flower stage by pollen from an inferior neighbouring palm. In other words, there can be no guarantee that nuts taken from a good plantation palm will develop into trees similar in all qualities to the mother palm.

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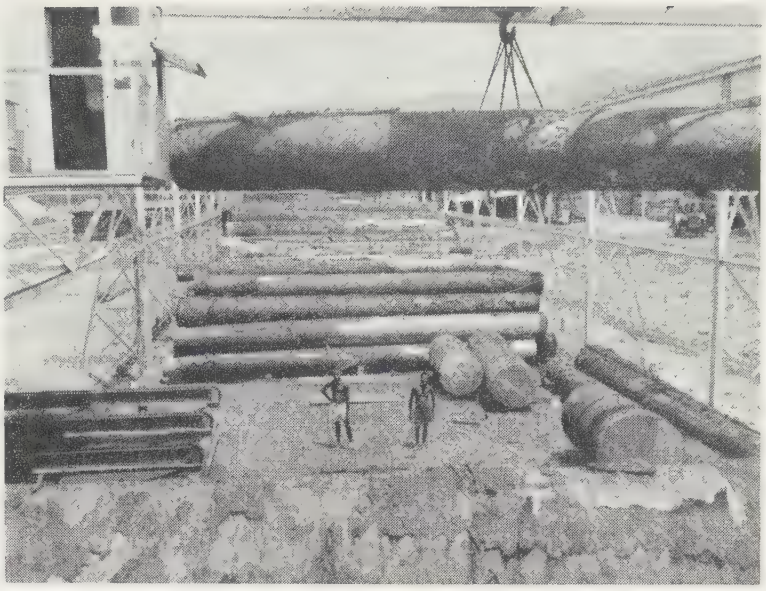
Right: Log stack at the highly-mechanized plywood mill operated at Bulolo by Commonwealth-New Guinea Timbers Ltd.

Right, centre: Timber truck hauling logs to the mill operated at Wau by New Guinea Goldfields Ltd. The construction of logging roads is a major task in this region, as most of the pine is located on steep ridges separated by deep gullies.

Right, bottom: Typical stand of Bulolo pine. The Klinkii tree shown falling was 185 feet high, with a butt girth of 13 feet, and contained 6,000 super feet of timber.

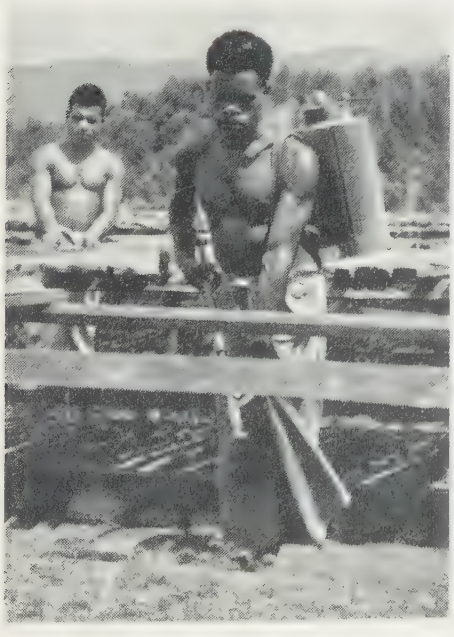
Below, left: Assistants at the Bulolo Forestry Nursery spraying six months old pine seedlings for protection against insect attack. They were grown from seeds taken from selected trees in the natural pine forest.



Timber Industry Grows Rapidly In Papua and New Guinea

A recently-approved programme for forestry development in Papua and New Guinea provides for a considerable expansion in forest survey work, and in re-forestation, while a forestry school will be established at Bulolo for training natives in survey, silvicultural and marketing control work.

THE post-war growth in the timber industry in Papua and New Guinea has been spectacular. The annual log cut in the territory now exceeds 50 million super feet per annum, compared with 13 million super feet in 1948-49, and it is estimated that the total value of production is more than £2,000,000 per annum. Several large sawmilling enterprises are operating, and a plywood factory and a veneer slicing factory have been established. A recently-approved programme for future forestry development in the territory provides for a considerable expansion in forest survey work. The objective will be the dedication of four million acres for forestry within ten years, and ten million acres within twenty years. At present 400,000 acres of forest land have been acquired.



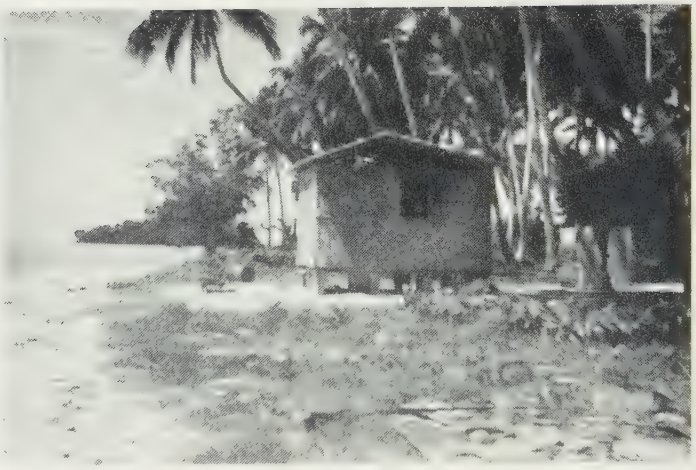
Additional trained forestry staff is to be recruited and the European and indigenous field staff augmented. As staffing permits, consideration is to be given to the manning of additional forestry stations.

A forestry school is to be established at Bulolo for training natives for positions in survey, silvicultural and marketing control work.

Research work will be continued on the silvicultural problems associated with hoop and Klinkii pine plantations, and emphasis will be given to the problem of natural regeneration of the main forest types of the territory.

Re-forestation will be expanded, particularly in the Wau-Bulolo forests of New Guinea, in the Trans-Keravat forest of New Britain, and in the Mt. Lawes territorial forest near Port Moresby. Regeneration will be encouraged wherever appropriate.

(Continued on page 31)



Above: The Administration's fisheries research vessel "De Goede Hoop". Right: On this coral island ninety miles from Manokwari, on the north coast of the territory, the Department of Fisheries is assisting local fishermen to salt down their catches for later sale on the mainland. The hut provides temporary living quarters for fisheries officers.

SPC Fisheries Survey In Netherlands New Guinea

The preservation and marketing of fish, small boat design, improvement of fishing gear, conservation of shellfish, and stocking of inland waters were among matters studied recently in Netherlands New Guinea by the Commission's fisheries officer, Mr. H. van Pel. He spent two months in the territory investigating marine and inland fisheries resources and advising the Administration on their development.

By H. VAN PEL

AN important part of the investigations into the marine fisheries resources of the territory was carried out during an eight-day cruise in the fisheries research vessel *De Goede Hoop*. The Director of Fisheries, Mr. W. A. Mackenzie, accompanied me on this trip.

We carried out experiments in handling and trolling which resulted in good catches of schnapper, Spanish mackerel, barracouda, trevally, jobfish, dolphin, tuna and shark.

Most of the fish taken were caught with six trolling lines while the ship, using an echo-sounder, followed a zigzag course along the edge of a steep submarine reef. One evening while anchored on the reef in six fathoms of water we took over forty red schnapper (*Lutianidae*) in two hours.

We returned to port with four tons of fish in the ship's refrigerated hold.

Above: In a trap built in the effluent from Lake Sentani, near Hollandia, Papuans spear schnapper migrating to spawning grounds at sea. Right: Part of the catch, which included fish up to thirty inches long weighing around ten pounds.

Above: Breeding tank for carp transplanted from Manila to Netherlands New Guinea last December. The fish-egg collector has been lifted to show the fibre which normally floats in the water, and on which the eggs collect. Right: A family fish pond nearly ready for stocking.

Fishing full-time we could have taken one ton per day.

Investigation Of Inland Fisheries

The main purpose of the inland fisheries survey was to find ways of increasing the aquatic food resources, not only of the lakes but of other inland waters.

With Mr. G. A. Reeskamp, Agriculture Officer, visits were made, mainly by hydroplane, to the large lakes in the region. These included the three Wissel lakes, one of which is 5734 feet above sea level. They are noted chiefly for the fresh-water crayfish caught in them, which provide most of the protein in the diet of the people living on their shores.

I also visited the Ajamaroe lakes which in addition to crayfish contain sepat Siam (*Trichogaster pectoralis*, R.) and kissing gourami (*Helostoma temmincki*, G. & V.). The latter species were introduced from Indonesia—an introduction that has proved very successful and of great benefit to the people.

Sentani Lake, near Hollandia, is the largest of the lakes in Netherlands New Guinea. Its greatest diameter is 16.8 miles. While populated mainly with fresh-water species, it is remarkable that some sea fish are also found in its waters. We watched Papuans spearing snapper in traps they had built in the effluent of the lake.

In general, our investigations in inland waters included observations on water temperature and transparency, *p*H (acidity) tests, lake bottoms, fish foods, water plants and insects, fish species and their breeding grounds, and local fishing gear.

Coconut Trees Threatened With Destruction

(Continued from page 22)

studied separately. Furthermore, the disease does not appear on palms under four years old; it is therefore believed that the symptoms appear, at the earliest, during the first two years following contamination. Under these conditions, it is anticipated that the research work under way at the Experimental Station at Guinobatan will be lengthy and costly.

The best means of fighting a virus disease is to discover varieties which are immune to it. Dr. W. C. Price (of the United States), virologist from the Food and Agriculture Organization now in charge of research on "cadang-cadang" in the Philippines, has recommended that coconut seeds imported from all over the world be planted at the Experimental Station at Guinobatan. As soon as the means of transmitting the disease have been discovered, it will be possible to test the individual resistance of each variety and it is probable that certain varieties will prove to be immune to "cadang-cadang".

Unfortunately, the funds devoted to this research work are not sufficient. Dr. Price has suggested that the Government should levy a tax of 1d. per 100 kgs. of exported copra and that the sums thus collected be paid into a special fund devoted to research work on "cadang-cadang". He is convinced that the disease can be conquered within a short time, provided the industry is willing thus to supply the necessary funds to finance the research work carried out at Guinobatan.

Re-Planting Old Coconut Land

(Continued from page 26)

Scientific selection and the development of a desirable and fixed species of coconut is such a long-term project that it may only be undertaken properly by a government agricultural station. For instance, before a guarantee of proven qualities could be given for seed nuts by a nurseryman, he would require to possess a grove of coconuts, each of identical breeding (the result of many generations of selected material), and his grove would have to be separated from ordinary plantation palms by a considerable distance to prevent undesirable hybridization.

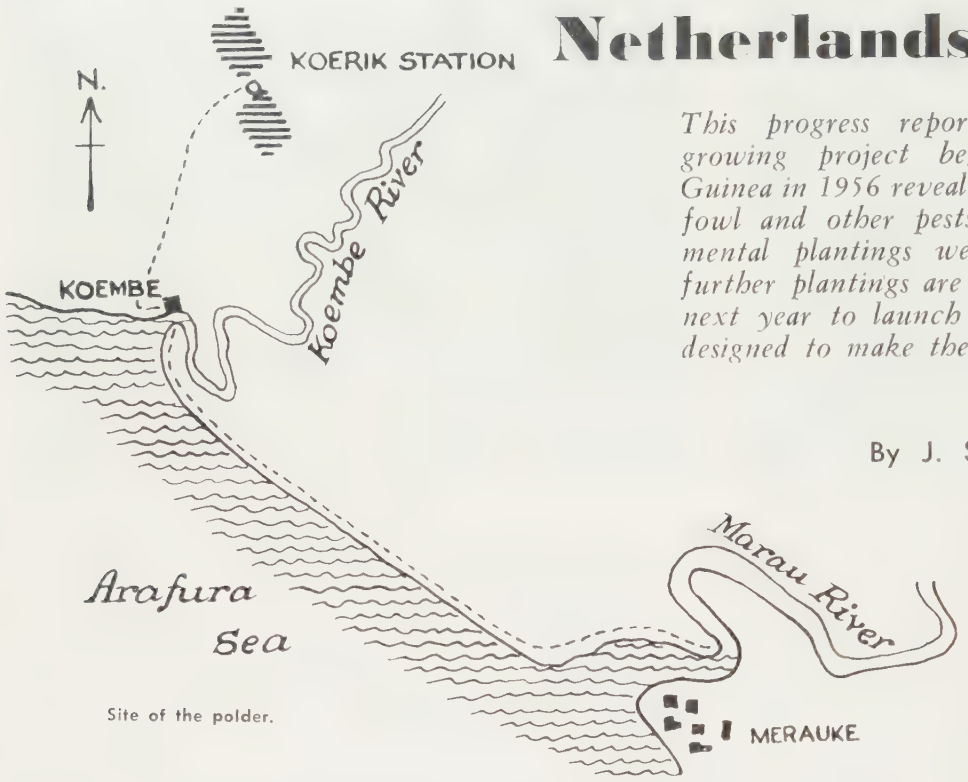
Notwithstanding the foregoing, seed nuts taken and planted from superior plantation palms, after strict culling in the nursery, will unquestionably achieve a better average in growth and bearing qualities than can be hoped for from seed coconuts gathered at random.

In plantations with good healthy palms, re-planting is unlikely to be considered until the trees have reached an age of over sixty years. At such an age the height of their crowns is generally forty feet or more above the ground level. Supposing the palms are spaced the usual thirty feet apart, there should be ample sunlight penetration for re-planting between the rows without the removal of the old palms. The advantage of gaining a substantial income from the old while the new are coming into bearing will not be overlooked by most planters.

Steep hillside re-planting, where erosion is likely to have taken a heavy toll of soil nutrients, is perhaps inadvisable without a small pilot project, and soil analysis is helpful anywhere.

Most estates contain areas of good fertile coastal flats, and unless the soil there is unusually poor, re-planting in such fields should not be unsuccessful.

Mechanized Rice Growing In Netherlands New Guinea



Site of the polder.

This progress report on a mechanized rice-growing project begun in Netherlands New Guinea in 1956 reveals that despite ravages by wild fowl and other pests, yields from early experimental plantings were encouraging. This year further plantings are being made, and it is hoped next year to launch the main project, which is designed to make the territory self-supporting in rice.

By J. S. VOLLEMA*

IN an article that appeared in the *Quarterly Bulletin* for January 1957, Mr. J. A. Lasschuit described the preparations being made for carrying out a mechanized rice growing project near Merauke, in the south of Netherlands New Guinea. He explained how the northern part of the first experimental polder was set up and how 192 acres were sown with rice during the months of January and February 1956.

This experimental polder was necessary in order to obtain the basic information required for launching a much larger project on sound economic lines. With this aim in view, the particular location of the polder was chosen because it contained the main types of soils to be found along the southern coast of Netherlands New Guinea. As the accompanying map shows, it is divided in two, the north and south parts separated by a sandy ridge on which is built the experimental station.

The First Rice Crop

In the northern part of the polder, the soil is mostly a greyish silty loam, leached, acid, unstable and subjected to sheet erosion. It is practically void of mineral nutrients and has very low exchange capacity.

For these reasons the first thing to do was to apply the three basic fertilizers: phosphate, nitrogen and potassium. Mineral dressings were also tried in order to determine which fertilizers would give the best results.

These experiments showed that rice will not grow without phosphates, and that it does do well with a mixture of nitrogen and phosphates, although it will not fructify sufficiently; this applies especially to varieties which have a long vegetative cycle. Adding potassium improved the yield. However, even with nitrogen, phosphate and potassium dressings, it was not possible to reach entirely satisfactory crop development. Symptoms of some sort of physiological disease appeared here and there. Kangaroos, deer, rats, ducks, wild geese and various insects caused some damage, but it was possible to control them effectively.

The rice was harvested in June 1956, using combine harvesters. While the average yield was 1077 lbs. of paddy per acre, some varieties such as Scrivimankoti and Blue Bonnet yielded 1784 lbs. per acre, which is a good crop for a first trial under difficult conditions. However, these results were not up to what was expected from the project, so, following this first harvest, trials in pots were carried out which showed that lime was also required and possibly some trace elements. Methods of cultivation of the soil may also play an important part.

The Second Rice Crop

Meanwhile, during the dry season of 1956, work proceeded on the artificial lake and the irrigation and drainage systems. Land reclamation in both parts of the polder had been finished, and everything made ready for the second sowing (1956-1957).

The area chosen this time, in the southern part of the polder, was of another kind of soil, a young marine clay with a much greater natural fertility than the older layers, leached and poorer, found in the northern part. During the first few months of 1957, 217 acres were sown in the latter and 79 acres in the southern part of the polder. Again six different varieties of rice were used (Dima, Markoenti, 77/5/10/2, Scrivimankoti, Rexoro and Blue Bonnet). Due to experience gained and to better fertilizing, the rice grew much better in the northern part than it had done the previous year. In the southern part, it was so sturdy that high hopes were held for an excellent harvest. However, after fructification, there was a sudden invasion of "mandars" (a kind of moor-hen) against which there were no adequate means of protection; in fact only small areas in the northern part could be saved while the southern part had to be abandoned.

In spite of the damage, the harvest in the northern part yielded 1375 lbs. of paddy per acre which was, in any case, well above the first year's average. On the better parcels, which had been adequately protected from the birds, the yield reached 2408 lbs. of paddy per acre. In the southern part of the polder, where 85% of the crop had been destroyed by the "mandars", the rice recovered somewhat and, thanks to a second flowering, yielded 519 lbs. of paddy per acre.

Dr. Vollema is a graduate of Wageningen University (Tropical Agriculture). He is at present engaged in agricultural planning in the New Guinea Department of the Ministry of Overseas Affairs, The Hague.

Papuans using knapsack sprayers carry out an insect control operation.

Taking into account the damage by "mandars" it was estimated that under normal conditions the northern part of the polder would have yielded 1784 lbs. per acre and the southern part at least 2230 lbs. per acre. These estimates, which already show that certain types of soil of the southern part are the best, will need to be confirmed when the time comes for the final choice. The areas to be used will have to be selected not only for the productive capacity of the two types of soil, but also taking into account the various requirements concerning tillage, fertilizing and weed control.

The technical side of the project was finished during the dry season of 1957, and clearing carried out. In 1957-1958 it is planned to sow approximately 277 acres in the northern part of the polder, and 163 acres in the southern.

The first parcels were sown as early as December 1957 and measures were taken to control any kind of pest or disease which might appear. More experiments will be carried out to gain further knowledge on requirements concerning fertilizing, tillage, green manuring and on the best varieties of rice to be used on either type of soil. Also, different crop rotations will be tried out on poor soils (rice, fallow, secondary crops, pasture).

Papuans Take Part In Project

A rice drying and processing plant will be ready for the 1958 harvest. Within the grounds of the experimental station the remaining houses for the staff are being erected, together with a number of dwellings for local workers.

The indigenous people—there are about 200 employed at the station—seem to have a knack for handling agricultural machines. Already these local workers are driving tractors and combine harvesters, and others are attending a training course in the use of draglines.

The Main Object

The experimental polder is in its third year of existence and, in accordance with the original plan, it is during the second half of this year that it will be decided whether or not the time has come to launch the main project.

Past experience has already shown that it will definitely be possible to establish, in southern New Guinea, a large mechanized rice-growing plantation. It also appears likely that the final choice of soil will be a young marine clay type, similar to that of the southern part of the polder.

A soil survey of the land lying between the rivers Maro and Koembe has revealed an area of 12,350 acres of young marine clay with physical properties similar to those of the marine clay in the polder; in fact, it even seems to contain more mineral nutrients than the polder. As it seems reasonable to expect that this fertile soil will give an approximate annual yield of 2,676 lbs. of paddy per acre, the area available would be ample to satisfy the rice demand of the whole of Netherlands New Guinea, whereas at the beginning it had been anticipated that at least 29,650 acres would be required for this purpose. In 1957, some work was already carried out in this area. An experimental field was cleared and sown last January with two varieties of rice. It is hoped that final planning for the main project will be completed this year and that it will be possible to launch it in 1959.

A combine harvester bringing in the first crop.

Timber Industry Grows Rapidly In Papua And New Guinea

(Continued from page 27)

Experimental afforestation is to be undertaken on the extensive grasslands of the Highlands to provide basic information on suitable silvicultural techniques in erosion, control works and the reclamation of grassland areas.

Provision is made in the programme for investigations to continue into the utilization of the many untried tree species available in the forests of the territory. Close liaison in this work will be maintained with the Division of Forest Products of the Commonwealth Scientific and Industrial Research Organization.

The task will be continued of building up a botanical collection of all the varied forest plants in the territory as a basic service to the Department of Forests and private sawmillers.

One of the latest additions to the Messageries Maritime fleet, M.V. "Polynesie" was built specially to carry passengers and freight between Australia, New Caledonia and the New Hebrides. Of 3,800 gross tons, she has a speed of 14 knots.

Training Officers For New Caledonia's Merchant Marine

To overcome a serious shortage of deck and engineer officers that developed in New Caledonia's merchant marine service in 1955, special training courses were organized. How these were set up is described below.

By J. LIGONIE*

THE task of New Caledonia's merchant marine is governed mainly by the location and commercial needs of the island. Ships are essential to keep it supplied with raw materials and foodstuffs, to carry its exports to other countries, and to carry cargo to points around the island and bring produce from them to the main port of Noumea.

These operations involve several types of ships, some to carry trade to and from Australia, the New Hebrides and the Wallis Islands, smaller vessels for the inter-islands trade between Noumea, the Loyalty Islands and the Isle of Pines, and finally coastal shipping. The present fleet is adequate for these tasks. The main problem is that of training crews to man the ships now and in the future.

This matter of personnel involves many factors, two of the most important being the law of supply and demand and the means of providing adequate training. In 1955, statistics revealed a great disparity between the number of posts open to merchant officers, and the few trained men there were to fill them. As a result, ship owners were compelled to employ many uncertificated seamen.

A further factor aggravating the position was that some officers in the service were very near retiring age.

Thus the need for an official training course became obvious, and in 1955 the local Assembly voted the necessary funds.

Initially the intention was to engage a professional instructor but lack of funds prevented this. Finally, some young officers volunteered their services as instructors and it was then decided to run an evening school.

Three Four-Month Courses Held

Between March 1956 and July 1957 three successive four-month courses were run by several instructors, each taking certain subjects in the curriculum which included cosmography, navigation, nautical reckoning, charts, maritime law and navigation code, safety at sea, mathematics, marine engines and machinery, English, and marine sanitation.

The subject of nautical reckoning is so important that it was shared between the instructors of astronomy and navigation. The instructor of astronomy dealt more specifically with reckoning by astronomical observation and calculation of total error; the instructor of navigation taught dead reckoning and tide determinations, etc. At the end of the course the two instructors organized tests to familiarize the trainees with the conditions they would have to face at the examination.

Instruction in mathematics was mainly practical and aimed at teaching the trainees how to use logarithm tables, calculate formulae, solve a triangle, etc.

The period of four months for each course was decided on as a compromise between the full year's course and a crammed one of a few weeks only. Also, many students already had some knowledge of the subjects being taught, while lastly, it was felt it would not be fair to force young men with small incomes to take long courses.

Classes were held in the evenings to enable seamen working during the day to attend.

The lectures were so arranged that they covered preparation for two examinations, for a master's ticket for ocean-going as well as for coastal ships.

The following lectures were given during the three courses (total hours are shown for each subject and course):

* Head of the Maritime Inscription Administration of New Caledonia.

	First Course	Second Course	Third Course
Navigation - nautical calculus ..	63	52	38
Cosmography - nautical calculus .	54	46	56
Law - safety	73	56	38
Mathematics .	45	32	40
Marine Engines	—	—	35
English	10	7	0
Marine Sanitation	—	—	2
	245	193	209

Lectures were followed by visits to ships where trainees familiarized themselves with instruments in constant use, such as the compass, pelorus or dumb compass, chronometers, sextant, etc. Homework in French, nautical calculus, etc., was also set. Finally, typewritten summaries of the lectures on navigation and cosmography were available to supplement and clarify notes taken by students.

A separate course was held for a ticket for masters of small vessels of 25 tons operating within 15 nautical miles of the coast. In this limited course, which lasted only two months, the emphasis was on navigation and chart reading.

The following examination results were recorded:

	First Course	Second Course	Third Course	Total
Master Coastal Shipping	2	1	3	6
Theory Certificate for Master Small Coasting Shipping	2	3	0	5
Master's Ticket Small Coasting Shipping	0	1	0	1
Theory Certificate Home Trade Shipping	0	1	1	2
Master's Ticket Home Trade Shipping	0	0	0	0

As the successful candidates soon filled all the vacancies for deck officers, the courses were discontinued. The position will need re-considering in several years time, however, when it will be necessary to provide training facilities for those candidates who have then fulfilled the mandatory few years of professional service at sea, and who wish to prepare for the examinations they will then be required to take.

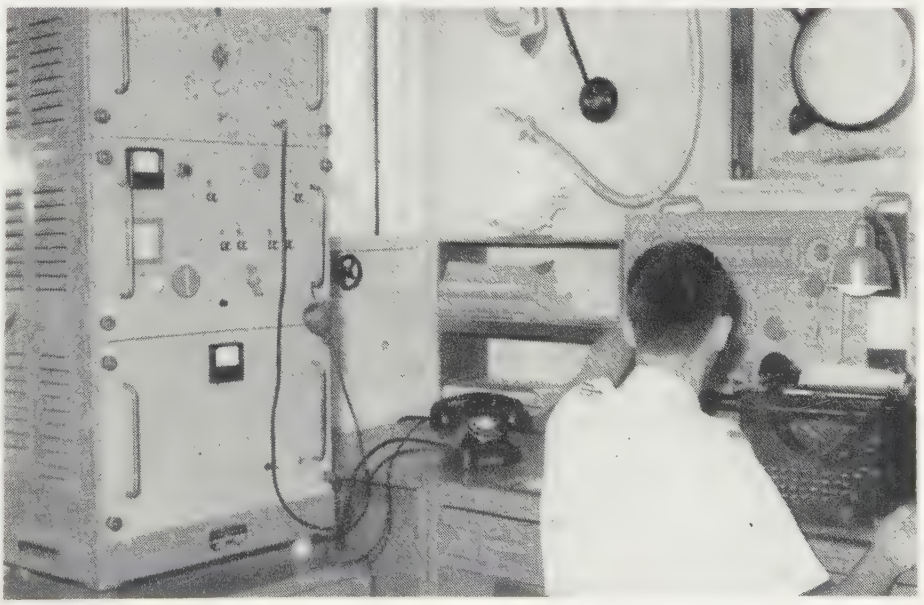
Though the demand that existed in 1955 for officers serving in New Caledonia's merchant marine was probably greater for engineers than for deck officers, a course for the latter was organized first as this was more practicable at the time.

However, partly because of the setting up of the naval base in Noumea and partly because of the arrival in New Caledonia of a young naval engineer who showed great enthusiasm for the project, circumstances later favoured inauguration of a course for engineer officers, and in 1957 one was inaugurated at the Technical College.

There are four instructors teaching the following subjects: calculus, physics and electricity, repairs to and maintenance of engines, maritime rules and regulations. Visits to ships are being organized, enabling trainees to study engines and machinery at first-hand.

The first batch of students qualifying as engineers should fill the immediate demand for this category of officer. If they prove satisfactory, a course for a lower level of engineer officer might be organized.

The fact that it has been possible to run these courses when in 1955 the difficulties appeared almost insuperable, makes it now possible to envisage the setting up of further training courses for other categories of specialists. The first will be a course for radio-electricians, who are not only required for the merchant marine, where needs are in fact limited, but for other organizations in New Caledonia, where they are in great demand.



In the radio cabin of the "Polynesie". The next merchant marine training course that will be inaugurated in New Caledonia will be one for radio-electricians.

Research Council Holds Ninth Meeting

(Continued from page 23)

specialist consultants — Miss Freda H. Gwilliam, Woman Education Adviser of the United Kingdom Colonial Office and Professor H. Belshaw, Macarthy Professor of Economics in the Victoria University of Wellington, New Zealand—and by Professor J. W. Davidson who again attended as observer for the Australian National University.

The Council thoroughly reviewed all aspects of the social development programme in addition to the topics specially designated, and its report to the Commission contains a number of recommendations in the fields of literature promotion, education and aided self-help which should serve to consolidate progress already made towards a programme of direct practical value to territories within these areas of concentrated effort and continuing interest.

These recommendations will be considered by the Commission at its next session, which will open in Noumea on September 26.

South America A Market For Pacific Copra?

The New Hebrides will shortly export copra to Venezuela, according to unofficial information just to hand from the Condominium. Contracts at a fairly good price are said to have already been concluded. Special freighters will carry shipments direct.

Dictionary And Grammar For Samoa

The author standing outside the dictionary office, which was set up in a large Samoan fale in Safune village on the island of Savai'i, Western Samoa.

Early in 1955 the author left London for Samoa, where, aided by six Samoans fluent in English, he spent twelve months gathering and compiling material for a Samoan dictionary and grammar.

By G. B. MILNER*

WHAT is the most difficult problem confronting education officers and teachers in the South Pacific territories? Is it the question of illiteracy or that of finding a suitable language as a teaching medium? Can the vernacular be taught at school and is it desirable that it should be taught? If so, what is there to teach other than reading and writing? If the vernacular is not taught as a subject, should it be used as a medium of instruction? Should children be taught from the outset to speak, read and write in a European language? Should all children be so taught or only those intended for secondary schooling? Is a student's general progress retarded when his first (or his second) language is ignored at school? All these questions have in recent years increasingly occupied those whose task it has been to plan the future development of education in Pacific Island schools.

A look at the linguistic situation in the South Pacific area must soon convince one that, at any rate for secondary education, another language is needed. It is needed not only at school but for adult life also, that is, in the maintenance of communication between, say, Europeans and Islanders or between Islanders of different language-groups or different areas and island-groups who already communicate much more frequently than they did in the past and who are likely to do so increasingly as travel facilities improve.

It seems fairly certain that in most territories some variety of English will serve as that second language, but that for a considerable period the native languages will remain in use in the home, in the village and even in a wider context where linguistic communities, as in Fiji, Tonga and Samoa, are relatively large. Yet a demand for education in English by the Islanders will not necessarily be accompanied by a lessening interest in the vernacular, particularly if nationalist sentiment is strong. (There is evidence of that in Samoa where all things Samoan, especially custom and language, are currently regarded as authoritative in matters of conduct.) On the contrary, it is the challenge of European ideas through the medium of a European language which may well lead a Pacific Islander to take a renewed interest in his own culture and in particular in his language, which plays such a vital part in maintaining, transmitting and enriching all other aspects of culture.

It cannot be seriously doubted that secondary and technological education needs to be provided in English or in another European language. But if no attempt is made to bridge the linguistic gap between Island culture and Western culture, and if it is Island teachers who teach English by the direct method, there is a grave risk that the Islanders will look on education as a body of mysterious knowledge learnt by heart, not to be understood, and acquired solely because it is thought to confer automatically special rights upon those who have access to it.

I should like to suggest that one of the ways of bridging this gap would be to make available a far greater number of dictionaries, vocabularies and phrase-books designed for use by the Pacific Islanders themselves. The main feature of these would be their bilingual character, that is, they would all contain a carefully-selected list of English phrases and sentences with equivalent phrases and sentences in the appropriate native language.

In 1949 the Director of Education in Samoa, Mr. Ken Lambie, who was actively promoting the production of simple reading texts for use in Samoan schools, found that his staff of translators was hampered by many difficulties. In particular the only authoritative work on the language was still the Grammar and Dictionary of the Rev. George Pratt, which originally appeared in 1862. This work went through four editions but it is now very scarce and inadequate for present-day purposes.

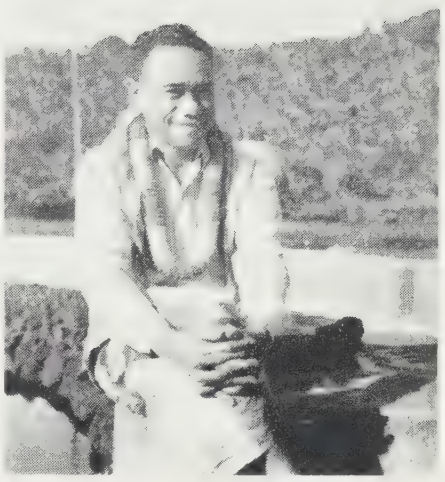
Owing to the nature of Samoan society there is no final court of appeal to which linguistic problems can be referred. A translator could thus hardly be blamed if he chose to use his own judgment and degree of knowledge of English.

On one occasion, however, the production of a simple school reading-book was already far advanced when it came to the notice of some Samoan officials. Not fully realising, perhaps, that a colloquial style was called for in a book designed for junior schoolchildren, and being unused to seeing the colloquial style in print, they were incensed by what they alleged to be faulty Samoan and the whole edition had to be scrapped. At other times the translators would go to the other extreme and, in their anxiety to use only words which could be used before a chief, they would use a style so formal that it might not be understood by young children.

Yet with no general agreement as to

* Lecturer in Oceanic Languages, School of Oriental and African Studies, University of London.

Left: The Reverend K. T. Faleto'ese of the London Missionary Society, the senior Samoan member of the language project team. Right: Talusa Tuitele, the only member of the team from American Samoa. An inspector of schools, he is a member of a chiefly family of Leone village on the island of Tutuila.



what constituted the formal style and what the colloquial, the translators could hardly be blamed. There were also other complications which need not be mentioned in detail. Mr. Lambie came to the conclusion that the help of a linguist from outside the territory should be sought.

Through the Islands Education Officer to the New Zealand Government, negotiations began between the Government of Western Samoa and the School of Oriental and African Studies. The Western Samoan authorities (with the support of the Government of American Samoa) undertook to make financial provision for the project and especially to give local clerical assistance. After the project had received several setbacks, I eventually left London for Samoa early in 1955, returning to England in 1956 after twelve months in the field.

It is well known that dictionaries vary a great deal. The length of time spent on gathering materials and compiling them, the number of contributors involved, the kind of literature consulted, are only a few of the factors which determine the scope of a dictionary. The English language, for example, with its considerable literature and world-wide usage, presents very different problems to a lexicographer from those he must expect with a language like Samoan, which serves a relatively small community and has only a small body of literature. But if Samoan cannot be expected to have the wealth of English, it must not be imagined that Samoan culture, with its emphasis on oratory and continuous political activity, is served by a language poor in vocabulary or lacking the resources to convey fine shades of meaning. On the contrary, Samoans are engaged on a great range of human activities involving many types of skill, and each has its own precise terminology. How then can the materials for a dictionary be collected in the short period of twelve months?

In the first place every dictionary must derive great benefit from its predecessors. Secondly, human experience is so varied that no dictionary can hope to be complete. Even while the lexicographer is at work old words fall into disuse and new words are coined. He must therefore resolutely make an estimate of his resources of time and information and try to strike a happy balance between the desirable and the possible. In this case I also had to bear in mind that the new dictionary was needed urgently, and so it was not possible to plan on spending several years collecting further materials in Samoa or on covering every item of printed matter so as to ensure that not a single term used in any activity during the last hundred years was omitted. (Such a task may confidently be left to future generations while pioneers confine themselves to essential tasks.)

Five dictionary assistants were made available from Western Samoa and one from American Samoa. There was a senior Samoan pastor of the London Missionary Society, a teacher trained in New Zealand who had an excellent command of spoken English, an inspector of Samoan schools from American Samoa, and the others all had some knowledge of English. All six took up this work on a temporary basis, two of them being seconded to the project by their respective employers.

In the village of Matavai, Savai'i, where much of the work of collecting material for the dictionary was carried out. In the foreground is the famous pool of Mata o le Alelo, associated with Sina, the famous heroine of Samoan legend. It is fed by an underwater spring.

The work was almost entirely carried out in two Samoan villages, namely Safune on the island of Savai'i (Western Samoa) and Leone on the island of Tutuila (American Samoa). The reason for choosing that kind of location was mainly to enable me to gain first-hand experience of Samoan culture and to learn the language as used in a traditional Samoan environment. It was also important that my assistants should have informal, ready and immediate access to as many elderly informants as possible without inconveniencing the latter.

The dictionary office was set up in a large Samoan house. (Samoan houses have no walls, either internal or external.) Each assistant was given his own table and chair and encouraged to refer his problems affecting Samoan to his colleagues and those affecting English to me. The atmosphere was informal and much *kava* was drunk. The villagers took a great deal of interest in the work at hand and their co-operation was greatly appreciated.

For the Samoan-English dictionary each assistant was given type-written lists of Samoan words in alphabetical order taken from existing sources (but without their context). He was to ask himself, (i), whether each word on the list was known to him, (ii), if it was known to him how many separable meanings that word could be said to have, and, (iii) to compose a brief phrase or sentence in respect of each separable meaning, care being taken to see that these examples were short, typical and idiomatic. He was to write these examples (or citations) in Samoan on sheets of foolscap, leaving enough space for translation into English.

I would then call each assistant in turn to my own table and for about an hour I would go through his accumulated material, trying with his help to arrive at an accurate translation for each citation. Then the assistant would go back to his table and by way of relaxation he would copy out each citation (in

Left: Miss Fetaui Matatumua, a teacher at Samoa College, Apia. As she had been trained in New Zealand she was of considerable help in the translation of colloquial English into Samoan. Right: The youngest member of the team, Sione Fauatea, photographed with the taupou (or ceremonial hostess) of Matavai village on the island of Saval'i.

ink) on a separate card with the suggested translation in pencil.

For the English-Samoan dictionary, those of my assistants who had a better grasp of English were given a copy of Dr. Michael West's General Service-List of English Words and Phrases. This work (which I found valuable and which deserves to be better known to teachers of English) not only gives the 2,000 English words which have been found to be the most serviceable to a learner of English, but also citations in respect of each principal sense in which that word is used, together with other statistical information.

Each of the citations provided by West (with occasional minor adjustments of wording required by the South Sea way of life) was to be translated into Samoan. In this case also I checked each translation in person to ensure as far as lay within my limited knowledge that it was a conscientious translation. This material was also copied on to cards. By these methods about 13,000 cards were collected—about 7,000 for the Samoan-English and 6,000 for the English-Samoan Dictionary.

Exacting as the task I had set myself proved to be, as a linguist I found this work of very great interest, above all because of the light it threw on many aspects of Samoan life and culture.

I did not regret the decision to work in villages, for to someone unfamiliar with Samoa many explanations were called for. These could often be cut short by simply pointing at, say, a plant or a household object within view of our office or at any rate readily accessible.

Time and again while I was walking about the village or in the bush one of my informants would say something like this: "Do you remember the word X we discussed the other day?" (a word which I had either not been able to understand or which I could understand roughly but could think of no suitable English word with which to translate it) "Well, this is another instance of it." Whereupon he would point at something, or carry out some action, and often I was able to get at the solution of the problem. Had our work been carried out in Apia or in Pago Pago, that is, in a non-traditional environment, it is doubtful whether the use of so many words could have been described so accurately.

If an explanation was not enough, a demonstration could sometimes be given (for example, a word only used, say, in the making of bark-cloth or in the preparation of some special dish). Words having reference to personal characteristics, to moral qualities or defects, could often be better understood by reference to certain people (known both to the informants and to myself).

It is often assumed that with the incorporation of many words of European origin, Pacific Island languages may be losing their true character and may even disintegrate. Those who hold such a view forget that it is necessary for the vocabulary of a language to be kept up to date in order that it may adapt itself to new human needs and activities. In English also new words (often borrowed from other languages) are coined to fit new concepts and new objects. "Streamlined" and "television" are already well established, whereas "sputnik" has not yet been generally accepted. Yet this process does not injure or corrupt the language as a whole. It is in much the same way that many new words have been added to the Samoan vocabulary in the last hundred years without disturbing the language as such.

To me, perhaps one of the most interesting features of this field-work was to see the light it threw on Samoan life and ways of thinking. Frequently I was at a loss to translate a word into English, not because I did not understand it, but because I could think of no equivalent in English without making use of a phrase or even of a whole sentence. Thus *ausage* refers to a family, the members of which have died or have gone away, and the word may also be used of a man of poor physique. *'aimelo* is "to show signs of being about to weep," that is, it refers to certain contractions of the facial muscles, indicating, say, a child is on the verge of tears. *'asa* is said of a fishing party which has failed to catch any fish and generally of any endeavour which does not come to fruition for any reason whatsoever. *feinofa'i* is said of two opponents facing each other in a threatening manner before a fight, as, for example, two roosters or two cats. *aufanaua* is the opposite of orphan, that is to say it applies to parents whose children have died. *na* means to stop crying. *pati* is to clap noisily, with the hands held parallel. *po* is to clap with the hands cupped and at right angles to each other. The difference between these two methods of clapping is significant in Samoan life and many other examples could be given of a contrast existing in Samoan between two words where none exists in English, and vice versa there are cases where English has the choice of several words closely related in their meaning while Samoan has only one.

Since my return to England with a great deal of other material, including sound-recordings, I have been working on the actual compilation of the dictionary, of which a considerable portion has already been written. I hope to complete first the Samoan-English part, then the English-Samoan, and lastly to undertake the grammar.

A Samoan Literature and Language Committee has been set up by the Government of Western Samoa and a similar body exists in American Samoa. Matters affecting orthography and other problems can be referred to these committees, and by that method contact is maintained between the compiler and the sponsors of the project. When the first draft of the typescript is ready I hope to pay another visit to Samoa in order to attempt to solve a number of problems left in abeyance and to verify a number of points about which more information or more precision is desired.

I am greatly indebted to the Governments of Western and American Samoa for their material help and encouragement and also to the many persons, both Samoan and European, who have so readily given me the benefit of their knowledge and judgment. I am particularly grateful to the six Samoan dictionary clerks who worked steadily and for long hours at a task which must often have seemed tedious and exacting.

FAO Forms Coconut Study Group

The Food and Agriculture Organization has established a Study Group on the Coconut and Coconut Products, a development of special interest in the South Pacific, where economic progress is largely dependent on the production and marketing of copra. The immediate and long-term duties of the Group were defined at its first session, held at FAO headquarters in Rome from November 25 last to December 3. Twenty-six specialists attended from the main coconut-producing and consuming areas of the world. The main conclusions of the meeting are reviewed below.

By E. J. E. LEFORT*

Sun-drying of copra at a trade store in Rabaul, New Britain. The formation of the FAO Coconut Study Group is of special interest in the South Pacific, where copra is the main income-earner.

AFTER a preliminary review of the world coconut situation the Group recorded that since the middle of 1955, copra and coconut oil prices have reached some stability. It was assumed that the price of lauric oils is not likely to increase in the near future, owing to the ample supply of soft oils and steady production of exportable tallow.

In order to make production plans in producing countries and assess probable supplies for importing countries, the Group recommended that its member Governments provide the FAO Secretariat with an up-to-date statistical data and relevant comments. On the basis of this and any other available information, the Secretariat will then prepare a report on the world coconut and coconut oil situation, for consideration by the Group at its second session (which will probably be held in Manila in October 1958).

It was suggested that the report deal with the following subjects:

Commercial production of copra, coconut oil, copra cake, and desiccated coconut in the producing countries.

Use, in the producing countries, of coconut oil and cake derived from commercial supplies of copra.

World trade in copra, coconut oil, copra cake, and desiccated coconut.

Use of coconut oil in the importing countries, in total and by major types of use (margarine, soap, etc.)

Prices of coconut products in consuming and producing countries.

Major events or conditions affecting supply or demand in 1957 and 1958 such as: effects of weather on production, changes in demand in producing countries, changes in demand in importing countries, changes in supplies of competing fats and oils, important Government policies or programmes, changes in import or export duties, or in other taxes affecting production, consumption or trade.

In the field of international trade, the Group requested FAO to issue a quarterly summary of up-to-date information on the trade in copra, coconut oil, copra cake and desiccated coconut. To enable FAO to do this, it was recommended that Governments should furnish data on exports by destination and imports by origin. This information should first be submitted for the calendar year 1957 and thereafter quarterly.

Project For Far East Recommended

The Group strongly recommended to FAO that a regional project be established for the Far East under the Technical Assistance Programme to:

(a) Analyse the data on sample surveys, conducted in different parts of the region, to assess areas under cultivation and yield;

(b) evolve suitable pilot schemes based on this material and organize them in representative areas in the region;

(c) draw up recommendations for suitable methods to be adopted by various countries in the region.

Member Governments in the region would, through FAO representatives, make arrangements to forward the request for this project to FAO.

Furthermore, the Group strongly endorsed the recommendation that member countries make use of the 1960 World Agricultural Census for a detailed stock-taking of the coconut industry to provide such information as area under coconut, whether specialised or interplanted types of holdings (estates, small holdings, etc.), age distribution of trees ("not yet bearing", "bearing", "senile"), and estimates of yields.

The Group gave attention to the possibility of obtaining and publishing regular figures of stocks of coconut oil, copra and copra cake in the principal producing and consuming countries, and requested the Secretariat to prepare a short methodological note on stock statistics for its second session.

The Group also recommended that any available information on studies of costs of production in producing countries be furnished to FAO, and that FAO arrange for the wide dissemination of such information among member countries.

Copra Quality And Standards

The important subject of quality and standards was discussed at length but

* Economic Development Officer, South Pacific Commission.

the Group was unable, at its first session, to come to any definite conclusions on the precise characteristics required for the market. It was stated that several difficulties had been encountered such as the standardization of methods of sampling and the varying quality of copra from a given source. Furthermore, agreement could not be reached on physical characteristics (colour, moisture content, size of pieces, etc.) or analytical characteristics (oil content, free fatty acid content, etc.) or on the relationship between these two principles of classification. It was considered that while these questions implied technical research, recommendations of a commercial nature would be useful in view of the economic factors involved, such as the cost of processing copra and the relation between prices obtained for the products.

The question of moisture content was emphasized, as this was considered to be the most crucial factor in the preparation and especially in the preservation of copra. Therefore, it was felt that much further research was required—particularly on the apparent relationship between moisture content and free fatty acids—before general recommendations could be made.

The Group considered it was nevertheless essential that copra-producing countries should have clear information on the technical standards required by users, in order to establish national systems of grading and to encourage production, processing, handling and marketing improvements. In addition, it was even more essential for producing countries to be able to judge if investments and other costs involved in reaching these technical standards were justified by an adequate increase in returns. It was therefore of the utmost importance that technical information should be available to member countries for them to evolve a sound economic policy.

It was considered that until the criteria for quality were more clearly understood and a broad basis of agreement reached between producer and user, it would be difficult to tackle the problem of poor copra quality. The reasons for it were of a varied but inter-related nature such as faults in techniques of production, weaknesses in the agricultural credit system and in the marketing organisation and structure, deficiencies in handling, transport and storage facilities, and lack of co-ordination of investments and of trained personnel.

If real progress were to be made in this field, it would be necessary to hold joint consultations at which producer and user should be well represented. The Group concluded that work on the standardization of copra quality could not be profitably undertaken until the fullest possible information became available, and therefore recommended that:

1: In view of the crucial importance of moisture content in the preservation of copra quality, particularly during processing, storage, shipping and handling, FAO should promote experimental work on desirable standards, including experiments on conditions most suitable for different regions.

2: In order to have the representative views of users of copra, the International Association of Seed Crushers should be asked to make available to the Group at its second session a report on the progress made in the work of its Sub-Committee on Copra Quality, it being understood that the work of the Association is concerned both with the desirable characteristics of good copra and with the views of the processors on factors determining the economic incentives which might be offered for better quality raw materials.

3: The FAO Agricultural Development paper: *Copra Processing in Rural Industries* should be circulated to members of the Group and observers for comment and discussions at its next session.

4: The same procedure should be followed in respect of the South Pacific Commission's Technical Papers No. 19 and 82, *Copra Grading in South Pacific Territories,* and *The Manufacture of Copra in the Pacific Islands.*

5: The governments of producing countries who are members of the Group should be requested to supply information by 30th June 1958 on the position in their countries. These papers should include factual statements on national grading systems and price differentials and on the provisions for administration and inspection under these systems. Governments are requested to make known their views on problems affecting copra quality, such as credit and marketing difficulties.

6: The Secretariat should circulate information furnished by producing and consuming countries to members of the Group and observers for study, as early as possible before the second session of the Group.

To allow for effective and rapid consideration of the information obtained, the Group decided to establish a standing Sub-Committee on Quality and Grading of Copra, with the following terms of reference:

(a) To facilitate the exchange of information on quality characteristics and grades desired by processors for the main edible and industrial uses;

(b) to provide a forum for the joint study by importing and producing countries, of the causes and effects of unsatisfactory copra quality;

(c) to analyse the incentives for improvement in relation to the cost of improvement, including a comparison of the price premiums currently paid for better quality copra as against the pre-war level;

(d) to consider means of establishing grades and specifications, inspection services and marketing facilities compatible with special conditions in individual countries and acceptable to users;

(e) to study and promote the rationalization of marketing measures to ensure that any increase which the user is willing to pay will benefit the copra producer.

Finally, the Group devoted some time to technical production problems. The Group was informed of the contents of the FAO questionnaire on coconut varieties and strains and on species of the genus *Cocos,* recently sent out to some 70 countries. The Group expressed the opinion that the collection of information on the existence and value of highly-selected strains would be of special importance to breeders working on this crop in all countries.

The necessity of modernizing coconut selecting procedures, possibly through international co-operation, was emphasized. Mr. Muttukumaru, Chairman of the Ceylon Research Board, called the attention of the Group to a paper by Dr. S. C. Harland, *The Improvement of the Coconut Palm by Breeding and Selection,* which will be published shortly. He stated that in Ceylon coconut-breeding work is being carried out along the lines proposed by Dr. Harland. He concluded with a request for FAO assistance in order to establish a collection of coconut varieties at the Ceylon Coconut Research Institute.

The Group was informed that the Plant Production Branch of the FAO Agricultural Division could help member countries to exchange coconut material. The importance of exchanging pollen from first-class palms was stressed, as this method is most efficient and also minimizes the danger of introducing diseases and insect pests.

Requests for information on coconut pests and diseases are already included in the FAO questionnaire referred to above. During the session special mention was made to measures to control the Rhinoceros beetle, certain diseases such as Cadang-Cadang in the Philippines, Kainkope in the Republic of Togo and "Lethal Yellowing" in Jamaica. The Group stressed the importance of international co-operation in regard to coconut pests and diseases, and was informed

(Continued on page 58)

The selection of coconut seedlings, here shown at the right stage for transplanting, is of the highest importance in the establishment of a healthy, high-yielding plantation. The author of the article below suggests and discusses useful criteria for selecting coconut seedlings.

Germination And Growth Of The Coconut

INTRODUCTORY NOTE BY THE EXECUTIVE OFFICER FOR ECONOMIC DEVELOPMENT, SOUTH PACIFIC COMMISSION

Immediately after the war the late Dr. P. J. S. Cramer prepared a manuscript entitled The Coconut And Its Products. *The author has drawn from the various sources of literature on the coconut all over the world, with two main objects in view: firstly, to make this scattered literature more readily accessible to those who study the coconut from various aspects; and secondly, by providing a review of the numerous problems as well as their related data, to enable the reader to draw his own conclusions. An attempt has been made to put these scattered elements into relation with each other and to arrive at a coherent survey of the whole field.*

With Dr. Cramer's death, work ceased on final arrangements for the publication of this valuable manuscript, which comprises a list of more than 800 references. However, his widow, Mrs. Cramer-van Deventer, has been kind enough to give her consent to publication of certain parts of interest in the South Pacific.

Reproduced below is an extract from a chapter on germination and growth of the coconut. In it, Dr. Cramer fully endorses the views on seedling selection expressed by Mr. W. V. D. Pieris (formerly Technical Officer with the South Pacific Commission) in his well-known booklet Wealth From The Coconut. *In it he stresses the importance of the selection of seedlings in the nursery as follows:*

THE SELECTION OF COCONUT SEEDLINGS IN NURSERIES IS THE MOST IMPORTANT SINGLE TASK IN THE CREATION OF A HEALTHY, UNIFORM, AND HIGH-YIELDING PLANTATION. SELECTED SEEDLINGS USUALLY GROW UP INTO HIGH-YIELDING PALMS.

Anyone interested in studying Dr. Cramer's complete manuscript is invited to write to the undersigned at Commission headquarters.

A. H. J. KROON.

AS the coconut palm takes some twelve years to arrive at full production, it is clear it would be of considerable interest if it were possible to determine the value of a plant at an earlier stage, preferably in the nursery. It would then be possible to transplant only the most valuable seedlings.

To a certain extent, this possibility does exist. Patel (India) found that the seedlings from early-germinated nuts have a quicker rate of leaf production and should therefore be selected. Nuts germinating later than four months after planting in the seed bed should be discarded, as it is frequently observed in estate practice that slow germination results in an inferior palm.

The rate at which seed nuts of approximately equal maturity germinate varies greatly. The nuts of the tall coconut palm commence to germinate after about three months. Jack found that germination rose to a maximum in the 17th to 18th week, subsided gradually until germination ceased in the 18th month after planting in the seed bed.

Early germination is an important criterion in the selection of the seedling. Patel selected mother trees according to the following characteristics: High yield, high production of female flowers, high setting, thick meat, big-sized nuts.

Patel found that high-setting mother trees are superior to the rest in respect of early germination. He also found that medium-sized round nuts having a husk of medium thickness should be chosen. He found, furthermore, that nuts harvested from heavy bunches (with twelve nuts or more) have a high percentage of germination.

Apart from early germination the development of the root system may give an indication of the vigour of growth, and also of the future productivity of the tree. Trees with a well-developed root system are better yielders than those with scanty roots.

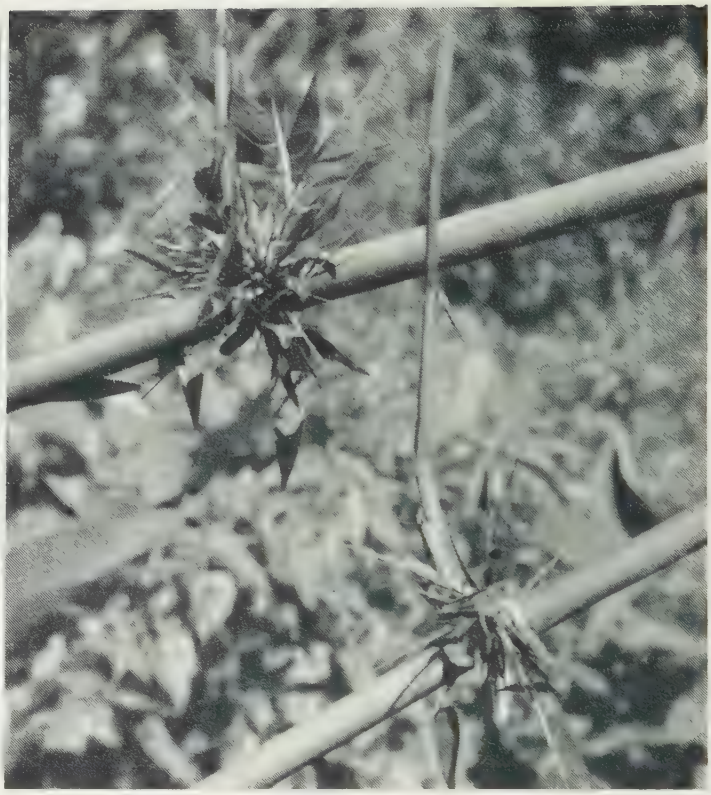
The development of the root system might perhaps be used as a criterion in selecting young seedlings in the nursery. The height of the seedling corresponds with the total length of the roots. The splitting of the leaves of the young seedlings begins earliest in the plants having the highest number of roots.

Germination and root development may be correlated with the growth of the plant in its further stages; however, more statistical data on this point are required.

Interesting experiments were made in the Philippines by Umali (1940) on the relation between germination and growth of the young plants and the origin of the nut, in which the best-growing seed-

(Continued on page 58)

Leaves and culms.



Branching of a culm.

SOME ESSENTIAL STRUCTURES WHICH CHARACTERIZE A BAMBOO SPECIES ARE ILLUSTRATED AND IDENTIFIED IN THE CAPTIONED PHOTOGRAPHS REPRODUCED ABOVE AND OPPOSITE. THEY WILL ENABLE LAY READERS TO UNDERSTAND THE FEW TECHNICAL TERMS USED IN THE ARTICLE BELOW. (BAMBOO SPECIES ILLUSTRATED IS ELYTROSTACHYS TYPICA).

Bamboos For The Pacific Islands (2)

In this instalment the author describes the main features of the eleven species of bamboo being introduced to the South Pacific under his direction.

By F. A. McCLURE*

FOR the recognition of bamboo species the culm sheath is generally the most useful structure of the plant. Sheaths from the middle range of the series and representing culms of plants of mature stature are the most characteristic. Those from the base and tip of the culm are often too generalized in their shape for purposes of identification. The illustrations following show a typical culm sheath for each of the species being introduced. The descriptions cover other features.

BAMBUSA DISSIMULATOR (x $\frac{1}{4}$)

BAMBUSA DISSIMULATOR McClure.

COMMON NAMES: Nai Lak Chuk (Cantonese)—Durable Thorny Bamboo.

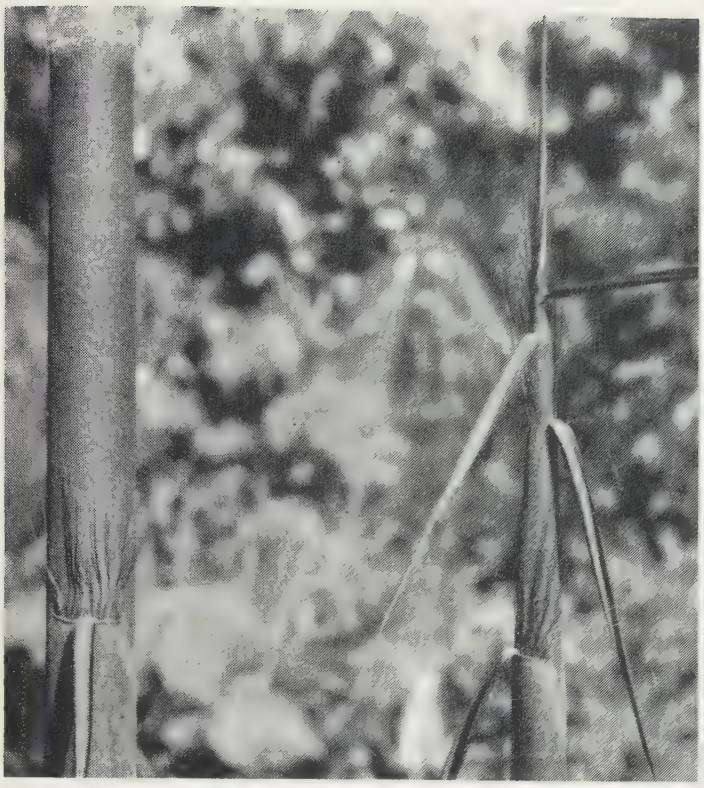
ORIGIN: China, Kwangtung Province; known only in cultivation, apparently of limited distribution, but frequently seen in the area.

USES: The whole, unsplit culms are used in heavy construction, fences, etc.

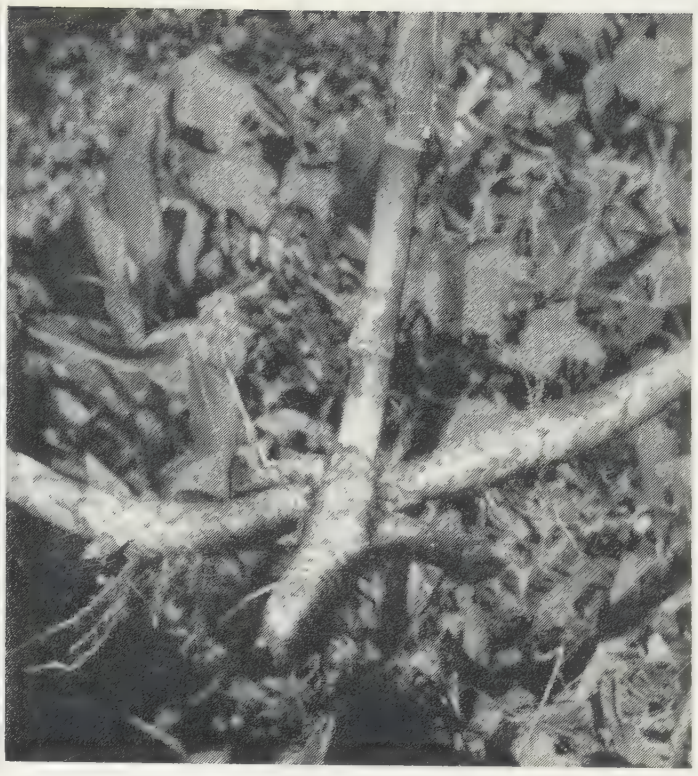
GENERAL FEATURES: Forming rather compact clumps, the culms relatively straight and erect, up to 15 metres tall and about 5 cm. in basal diameter; internodes cylindrical, smooth or perceptibly pubescent, of moderate length (up to 25 or 30 cm. in plants of mature stature), with wood about 1 cm. thick; nodes only moderately prominent, all or nearly all developing branches; branch complement not heavy, the main branches at lower nodes sometimes (not always) bearing a few weak, straight spines.

NOTABLE FEATURES: A very vigorous, productive bamboo, with relatively straight culms and hard, durable wood of moderate thickness. The species is variable in minor features such as pubescence and white striping on the culm sheaths and lower culm internodes and the degree of development of the thorns. These are never a problem as they are, for example, in *Bambusa arundinacea*, the giant thorny bamboo of India. Under certain conditions a plant

* Dr. McClure, a leading world authority on bamboos, is consultant in tropical forestry to the Maria Moors Cabot Foundation of Harvard University.



Culm sheath and sheath blade with ligule.



Branched rhizome.

may flower partially over a long period of years but without any apparent unfavourable effect on its vegetative vigour.

BAMBUSA MALINGENSIS McClure

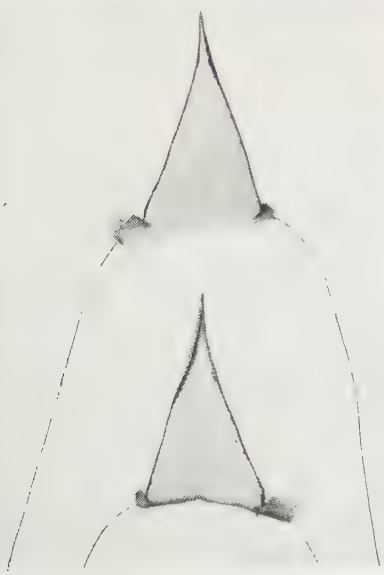
COMMON NAMES: Ma Ling Chuk (Cantonese)—Bamboo from Horse Range.

ORIGIN: China, Hainan Island. Wild on Ma Ling (Horse Range), a mountain in Yai District, southern Hainan, and cultivated in the vicinity.

USES: The whole culms are used for light elements of general construction: withes split from the culms are used in weaving. In the old days this bamboo was much sought after to make stems for opium pipes because of the perfection of the shape, smoothness and stability of the internodes and the decorative nature of the branch bases.

GENERAL FEATURES: Forming compact clumps, the culms very stiff and straight, erect or sub-erect, under favourable conditions up to about 8 metres tall and 2.5 cm. or a little more in basal diameter, with wood about 0.5 cm. thick; internodes perfectly cylindrical, smooth and glabrous, up to about 45 cm. long in plants of mature stature; nodes scarcely, or not at all, elevated or inflated above the thin sheath scar, all or nearly all developing branches, the branches all rather slender, the central (median) one lightly dominant, all unarmed.

NOTABLE FEATURES: An elegant bamboo with fine-grained, hard, durable wood and stiff, straight culms which should find many uses in any domestic economy. The plants are generally very healthy, but only moderately vigorous.

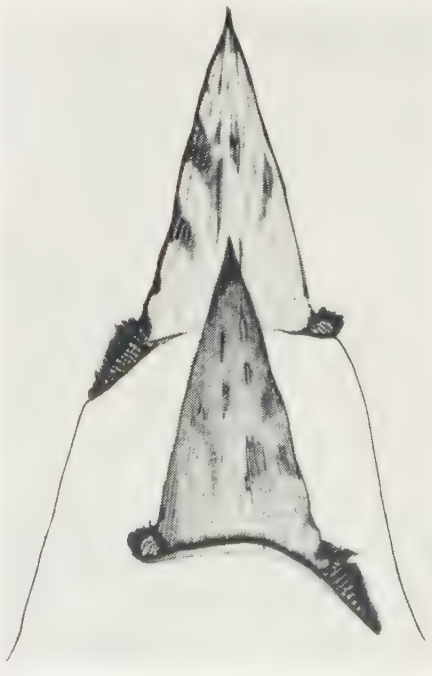


BAMBUSA MALINGENSIS (x $\frac{1}{3}$)

BAMBUSA PERVARIABILIS McClure

COMMON NAMES: Yau Chuk (Cantonese)—Protector Bamboo; Superior Bamboo.

ORIGIN: China, Kwangtung Province; known in cultivation only; of limited distribution probably because it is more difficult to get established and less productive than *Bambusa tuldoides*, whose



BAMBUSA PERVARIABILIS (x $\frac{1}{2}$)

culms appear on the market for this bamboo at a lower price.

USES: The whole culms are used for general construction, particularly for the erection of temporary structures. They are of a convenient size, very uniform in proportions and one of the strongest and most durable of the known species. For these reasons it is possible to use the same culms over and over again for many years since they outlast many times over the other materials of construction with which they are generally used.

GENERAL FEATURES: Forming very compact clumps, the culms very stiff and fairly straight, strictly erect, under favourable conditions reaching a height of about 15 metres and a basal diameter of 5 cm. or a little more, with wood about 1.5 cm. thick; internodes relatively short, up to about 30 cm; cylindrical or nearly so; nodes noticeably but not prominently inflated above the sheath scar, all or nearly all developing branches, the branches numerous, strongly unequal, very stiff, the median one strongly dominant, all unarmed.

NOTICEABLE FEATURES: A species rather variable in minor characters, such as pubescence and white striping on the culm sheaths and culm internodes. The culms are very stiff and relatively straight and the wood is thick-walled and extremely hard and durable when properly matured and cured. This is one of the most highly-valued bamboos in the economy of Kwangtung Province. Its leaves are subject to the attacks of a rust, but this does not seem to do any appreciable damage.

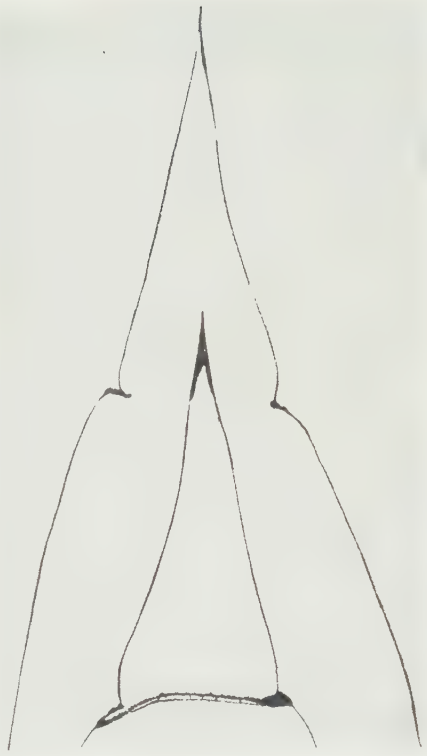
BAMBUSA TEXTILIS McClure

COMMON NAMES: Mit Chuk (Cantonese)—Thong or Withe Bamboo; Wong Chuk—Yellow Bamboo (from the yellow colour developed in matured culms when they are exposed to the sun).

ORIGIN: China, Kwangtung Province; widespread in cultivation.

USES: Sections of whole, unsplit culms and strips of the same are used as light structural elements in houses and for the manufacture of small chairs and stools of a very sturdy and durable nature. Withes of various dimensions are used in making hats, basketry, matting and cables, and for binding together the bamboo frames of buildings and scaffolding.

GENERAL FEATURES: Forming relatively compact clumps, the culms straight, stiffly erect, nodding only slightly at the tips, under favourable conditions up to 12 metres or more in height and 5 cm. in basal diameter, with wood about 0.5 - 0.75 cm. thick; internodes strictly cylindrical, the lower ones at first strewn in the upper half with stiff antrorse



BAMBUSA TEXTILIS (x $\frac{1}{4}$)

hairs; nodes prominent only at the sheath scar, in culms from clumps of mature stature entirely free of buds and branches except in the upper $\frac{1}{4}$ of the culm; branches all slender, sub-equal, the median one only slightly dominant, all unarmed.

BAMBUSA TULDA (x $\frac{1}{4}$)

SPECIAL FEATURES: The culms are distinguished by straightness and uniformity, their straight grain and excellent splitting quality, the fine texture of the wood and its relative immunity to the attack of wood-eating insects when properly cured. At Canton the branches of this bamboo do not begin to develop on new culms until the onset of the succeeding rainy season, several months after the culms have reached their full height. Numerous intra-specific variants of this bamboo occur in Kwangtung Province.

BAMBUSA TULDA Munro

COMMON NAMES: Tulda bans (Bengal); Thaik-wa (Burm.)

ORIGIN: "Central and Eastern Bengal, Assam and Burma . . . the most common kind in the Lower Bengal rice country and in the Assam valleys." (Gamble).

USES: All general purposes: building, scaffolding, making of mats and baskets. The young shoots are, according to Roxburgh, pickled and eaten.

GENERAL FEATURES: Forming rather compact clumps, the culms ascending or sub-erect, broadly arched at the tip, up to 20 metres tall and 10 cm. in basal diameter, with wood up to 2 cm. thick; internodes somewhat long (up to 60 cm.) at mid-culm according to Gamble; the nodes only moderately inflated, all or nearly all bearing branches, the median branches rather heavy, flanked by numerous smaller ones, all unarmed.

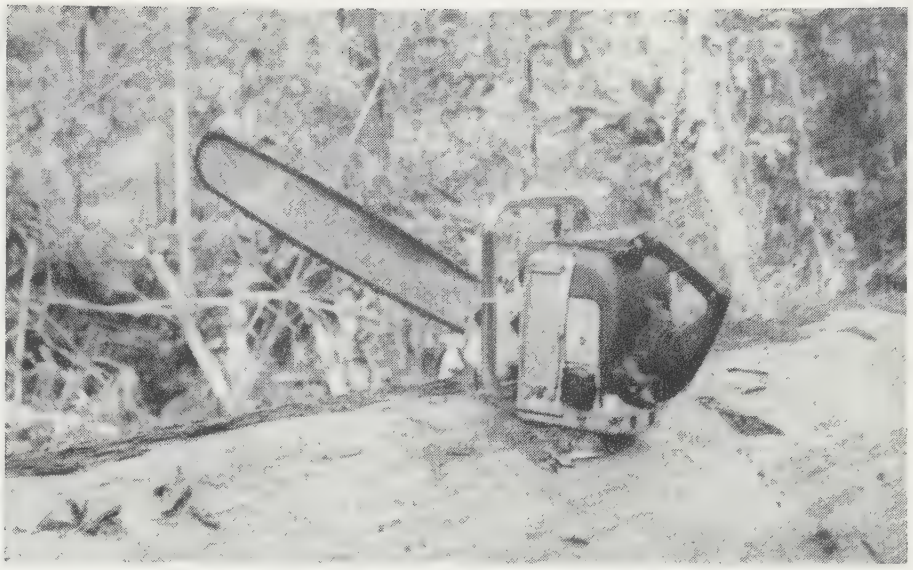
NOTABLE FEATURES: A vigorous, very productive bamboo with strong, relatively straight, gently tapered culms, the wood firm, straight-grained. The wood is somewhat susceptible to the attacks of the powderpost beetle unless well-matured, properly cured and protected at first by spraying with DDT.

(to be concluded)

Coconut Pest Breeds In Fijian Bures

IN Fiji the campaign continues against the pest which threatens the Colony's £3 million copra industry, the rhinoceros beetle. So far, it has been confined to the island of Viti Levu and has not spread to the main copra-producing islands of the Group.

A report recently issued by the Coconut Pests and Diseases Board reveals that Fijians who fail to change the grass beneath the matting in their bures every three months as required by Fijian Regulations are providing breeding sites for the rhinoceros beetle, and thus helping to defeat the efforts of the beetle control teams. It was stated that 38 beetles were found in the earth floor of one bure at Taci Village.



This one-man chain saw with 5 h.p. motor was the larger of two used in a demonstration of logging equipment recently arranged by the Forestry Department of New Caledonia.

Chain Saws Speed Up Logging

By E. J. E. LEFORT*

A spectacular advance in the logging industry was made around 1950, when the portable power-driven chain saw was developed and came into popular use.

IN the last few years various robust yet light models of one-man power-driven chain saws have come on the market. In this type of saw, cutting teeth are linked in an endless chain driven by a petrol motor of around 4-5 h.p. These saws can be operated at any angle, and their use permits the felling of even large trees quickly and efficiently.

Experiments in Africa have shown that the cost of felling with chain saws is slightly lower than when axes are used.† In one official demonstration an expert, using a chain saw with a blade only 2'5½" long, felled 140 trees, aggregating 43,218 cubic feet of timber, in 40 working hours spread over 10 days. Actual felling time per tree varied between 6 and 42 minutes, for trees measuring from 3.6 and 6.3 feet in diameter. In practice, these figures represent an average daily output of 3,530 to 4,240 cubic feet of rough timber.

It is unlikely that such a rate of output can be achieved in territories such as New Caledonia, where most of the timber is taken from forests on very hilly country. Nevertheless, even in such territories the use of chain saws can offer very interesting prospects for the lumber industry.

At the sawmill. Bucking a kauri log with an electric saw.

Essential Requirements

The ideal one-man chain saw should be light, powerful, strong, easy to handle, and equipped with a carburettor which will operate in any position.

Most of these saws are fitted with gouge-teeth chains which can be sharpened with an ordinary round file. (On the other hand, two-man saws used for bucking—or cross-cutting—carry chains with tracing and plane teeth.)

With regard to motor power, it is generally accepted that 4 h.p. is the minimum. It is also considered that a weight of 25 lbs. should not be exceeded for a one-man saw if the operator is to maintain his efficiency throughout the working day.

Although the handling of a one-man saw is quite simple, nevertheless a certain amount of adjustment on the part of the worker is involved. As in any other skilled manual job, operating such a saw involves the use of some muscles more than others. However, familiarization with the machine takes only a few days, and from then on an increase in output is noticeable.

Bucking With A Two-man Chain Saw

For this operation weight is less important; on the contrary, if the saw is well balanced it can even make sawing easier.

Weight can be increased up to 145 lbs. and power to 18 h.p. The maximum cutting capacity (up to 10 ft.) naturally depends on length of blade and dimensions of the second handle.

These bucking machines are generally

* Economic Development Officer, South Pacific Commission

† In a territory such as New Caledonia, where daily wages are at least five times higher than in Africa, the use of chain saws for timber getting should be correspondingly more profitable.

Bucking a log after felling, using a chain saw with motor developing 10 h.p.

A D6 Caterpillar tractor hauling a log of "houp" pine.

driven by an electric motor if a local power supply or generating unit is available; otherwise by a petrol engine.

Demonstration of Logging Equipment

At a recent exhibition of logging equipment organized by the Forestry Department of New Caledonia on a property in the Thi valley, a demonstration was given of one- and two-man chain saws, bucking saws, and a caterpillar tractor fitted with a logging winch.

ONE-MAN CHAIN SAWS demonstrated were:

Mac Culloch type 39, developing 4.2 h.p., weight approx. 21 lbs., 2 ft. 2 in. blade, gouge-teeth chain, diaphragm carburettor, automatic centrifugal clutch.

Mac Culloch type 47, developing 5 h.p., weight approx. 23 lbs., 3 ft. blade, gouge-teeth chain.

BUCKING MACHINES demonstrated were:

Rexo type SI saw, developing 10 h.p., weight 115 lbs., with plane and tracing teeth chain.

PPK saw with electric motor type 200 developing 12 h.p., weight 145 lbs. The generating set used for this machine is mounted on a trailer.

Both the one-man chain saws demonstrated can be used to fell trees with a diameter twice the length of the blade or even more, provided a certain simple, easy-to-acquire technique is observed.

According to the task in hand, blades of different lengths can be fitted, resulting in a cutting range from 1 ft. to 3 ft. 8 ins. With a longer blade the saw naturally becomes heavier (every 4" of blade adds approximately 1 lb. in weight). A long blade makes for easier work, but the added weight increases fatigue.

During a felling demonstration with the Mac Culloch type 47 saw it took exactly 11 minutes to bring down a "houp" pine (*Araucaria cookii*) 3 ft. across.

Bucking was tackled just as efficiently, using a Rexo SI chain saw.

Hauling Demonstration

The hauling demonstration showed that logging problems are not always simple. Attempts were made with a Hyster winch mounted on a D6 Caterpillar tractor to drag a "houp" pine log of approximately 280 cubic feet out of a steep ravine. The cable was run out through a single block hitched to the log, and back around the base of a sturdy tree. After several attempts it was obvious the D6 was not powerful enough to haul the 14 or 15 tons of timber out of the ravine. Although conditions were difficult, the log was bucked in half with the Mac Culloch type 39 chain saw, and hauling then proceeded easily.

Later at the sawmill a high-power electric chain saw—the Dollmar type D.150 bucking machine developing 11.2 h.p. and weighing approximately 145 lbs.—was demonstrated. Two skilled workers cut through a kauri (*Agathis lanceolata*) log 4 ft. across in 4 minutes. Fitted with a special chain, the same machine can also be used to split lengthwise any log too large to be loaded on to the log carriages used with standard band-saws.

Use of discussion methods as a means of changing health behaviour. These students at the recent SPC-WHO Health Education Training Course are re-enacting an actual situation in an island community.

How People Learn And Change Their Behaviour

This article was a background paper for the health education training course for Pacific islanders, held under SPC-WHO auspices at Commission headquarters in July and August of last year.

By MORVEN S. BROWN*

HEALTH education has three sides to it: it means changes in knowledge and understanding; changes in attitudes and values; and—most important of all from the practical point of view—actual changes in behaviour. Unfortunately, these three types of change do not always happen together, so that it is possible to get people to believe things with their minds, and yet still feel opposed to them in their deeper feelings.

Suppose we are attempting to control mosquito-borne diseases like filariasis or malaria. To get people to do something about these diseases it is necessary to persuade them that they are in fact carried by mosquitoes and give them simple information about how this occurs. Secondly, it is necessary to make them feel strongly that something can and should be done. And, finally, they have to be brought to do such things as putting up gauze doors and windows; dealing with breeding pools and so on. The really important thing is that they should do these latter things; and they are not likely to do them unless we have effectively changed their minds and their feelings.

Change In Understanding

The main practical concern of the health education worker is in the actual change of behaviour, in the form of habits of action, that result from his efforts. But he cannot be sure that this behaviour will be intelligently carried out or that it will be lasting unless it is built upon deeper changes of belief and understanding.

This new understanding can under favourable circumstances be given through well-directed lectures, talks, films, broadcasts and pamphlets. The greatest care, however, has to be taken to see that the ideas presented in these forms are pitched at the right level and adapted to the way of life of the community being reached. A poster on venereal diseases, for example, that goes quite successfully in a community in which the relations between sexual intercourse and disease can be assumed, may fail to register in a community where gonorrhea is so widespread that this basic fact needs explanation.

All teachers know that the "context" of learning is of basic importance and that you should not even begin a lesson without calling up related knowledge in the minds of the pupils. By doing this the good teacher adjusts his lesson to the mental level and background of knowledge of his class, and so makes his new information really stick. Similarly, all health education workers have to adapt their message to the mental context of their audience. They must always keep in mind the question whether they are talking to illiterates or educated people, to dull or intelligent groups, to men or women, people of high rank or low rank, young people or old people. And they need to have an intimate knowledge of the interests, the values and the prejudices of the communities they are trying to influence. If they fail to remember these things much of their education will be wasted because it will fail to register properly.

Giving new knowledge, however, is not just a matter of making health information available, important though this undoubtedly is. People do not see things correctly simply because we explain them carefully. They often fail to perceive what we tell them because they are in reality loath to give up traditional ideas that are more satisfying to them, and therefore have more meaning for them. Thus a belief in the effects of magic in causing disease may appear very much more plausible than a scientific explanation because of the sheer prevalence of ill health. Hogbin, for example, in describing the situation in Malaita (in 1939) says: "There are many unpleasant tropical diseases, such as malaria, dengue, blackwater fever, framboesia, leprosy, elephantiasis, hook-worm, and tropical ulcers, as well as those introduced by Europeans in the 19th century, including tuberculosis, dysentery, whooping cough, measles, gonorrhea and influenza. For none of these is there any known remedy except magic, and a man is lucky if he goes through the year without confinement in bed for two or three weeks. Every performance of magic is thus inevitably followed sooner or later by the illness of the victim".[1]

Changes In Attitudes And Values

All of this means that since people's beliefs and their view of the world are not always in line with reality, appeals to reason do not always reach them. The problem of changing their understanding is bound up with the problem of their basic attitudes and values. And this latter type of change is not only the one that affects the education of the mind—it is the one that determines whether the learners will go on wanting to do the things they are being led to accept as desirable.

The task is to create attitudes and values that will motivate and support an interest in good health. This is often

* Professor of Sociology, Head of the School of Humanities and Social Sciences, N.S.W. University of Technology.

1 H. Ian Hogbin, *Experiments in Civilization*, London, 1939, p. 87.

difficult, for it means altering deep-seated attachments to existing beliefs and attitudes that are shared by the other members of their communities. To ask people to change their health habits is often to ask them to alter attitudes which they have derived from their parents and friends over all the years of their development, and which are supported by the whole way of life of their social group.

In urging them to change their way of life we are likely to call forth resistances that can easily interfere seriously with the success of a programme of health education. Unless the individual or the community being approached is rendered co-operative, the chances are that they will not simply remain indifferent to what is put to them. They will tend to respond with hostility, for that is the normal reaction of people to alien ideas that threaten to disturb their established way of life. The hostility may not show itself as outward aggressiveness. It may simply be expressed in "negativism" — non-co-operation — towards the health education officer or team. Or at a deeper level still it may issue in a displaced form of aggression—namely tension and bad feeling between members or groups within the community. In this case the new health practices may be dearly bought if the price paid for them is social disturbance or widespread mental ill-health.

When people resist re-education they are really resisting threats to their own feelings of security and their own feelings of self-esteem. It is these feelings that often have to be reassured in the new learning that takes place, so that the new ideas and practices are woven into the traditional ways of thinking and feeling that are already in existence.

Of course in times of crisis, like an epidemic, appeals can be made to fear, with some short-term prospect of success. But such propaganda usually wears itself out fairly soon. This is because it is usually mistaken to assume that people anywhere have any deep continuing concern for personal or community health. To get them to be seriously interested in it, it is necessary to appeal to other more potent needs they have for such things as security, affection and recognition, as these are realized in the culture of their local community.

Health education, like other forms of education, works best when it relies on voluntary co-operation. The old adage that "you can lead a horse to water but you cannot make him drink" applies very strongly. Fear of punishment or fear of illness will not produce lasting change or lasting acceptance of relevant medical knowledge. The people concerned have to accept freely and spontaneously the new attitudes and conduct considered necessary if health education is going to have really satisfactory results. As the late Kurt Lewin puts it: "Much stress is laid on the creation, as part of the educative process, of an atmosphere of freedom and spontaneity. Voluntary attendance, informality of meetings, freedom of expression in voicing grievances, emotional security and avoidance of pressure, all include this element".[2]

The learning process, to be most successful, has to go on in an atmosphere of voluntary interest. The new behaviour should seem to meet some real need in the learner, and give him a feeling of reward and satisfaction when he practises it. Sometimes the reward comes in the improved health that results, as when a baby with rickets benefits from a changed diet. But often the health outcome arising from the new practices occurs too far ahead to motivate the learner; or else their results are only apparent in the figures collected by the Administrator or the medical research team. To the ordinary person, there is often no apparent connection between the new diet he is asked to follow, the new type of house he is asked to build, or even the vaccination he is asked to take, and any subsequent improvement in the general level of health in his community.

Social Influence In Learning

The health education worker has to find a variety of means of making the new behaviour he desires satisfying. He needs to make his own contacts with people as pleasant and cheerful as he can, so that they enjoy their association with him. He should be generous in the use of praise, and he should at the same time subtly convey a feeling of privilege and status on those who work with him. While maintaining a friendly respect for the people with whom he works he should strive to create an atmosphere of prestige and importance about his educational as well as his medical activities.

There are usually limits to the satisfactions that the health education worker can himself provide. To overcome resistance, to allay anxiety, and to draw on deeper sources of psychological reward, he needs to turn to the satisfaction that the individual derives from his surrounding community.

The behaviour of every person is very intimately connected with the behaviour of those with whom he has grown up and with whom he now lives. In fact, the traits and characteristics he shares with others form a kind of pattern of life which anthropologists call the culture of his particular society. This culture, or way of life, of each society is immensely important in moulding the beliefs and attitudes of its component members, for, existing as it does prior to each individual's birth, it seems to him as he grows into it to represent the only really human or natural ways of doing the important things of life. It gives him his religious and magical ideas, his language, his manners, his code of sexual behaviour, his conception of himself and his body and of the meaning of health and disease. To change him in these respects is to drive a wedge between him and his culture, and to produce confusion and anxiety in his whole personality.

Fortunately even cultures are not finally fixed or static, and it is possible to change them, providing we try to take account of the resistance they offer. It is wise to remember that a culture is a unified thing, and that you cannot always change it by arguing logically with individuals over one point at a time. If people in a community, for example, really believe that to die is to take on another much happier life, they may not be deeply moved by figures showing the high death rates resulting from various diseases. A culture should be seen as an organic whole which gives meaning to the various individual traits within it. To change a particular belief it is often necessary to change the deeper beliefs, deriving from the culture, that support it.

Health education workers have found that some of their best and most lasting results have been achieved when they work *with* communities and make use of the reward resources the communities contain. That is, when they try to get the people being influenced into small groups in which very free and frank discussion about health matters can take place. The group members then do not feel they are being attacked, or that some alien expert person is pushing them about. When they talk out their hostilities in a small group situation they usually find that the advantages of much of the new behaviour become apparent to most of them. Those who become accepting of change then support each other, and the new practices start off in an atmosphere of community support. When this happens the culture has really undergone a change and improvements are likely to prove lasting.

There is now a whole body of knowledge called group dynamics that examines how these individual changes are brought about within the medium of small groups. The theories and techniques of group dynamics should be of the highest interest to health education workers.

While the use of small groups is generally useful, it is often of particular value if the groups include influential people in the community. Every community has a social structure, a series of ranks composed of people having different levels of authority or prestige. These are the people whose attitudes can be swayed with far-reaching effects.

It is to be noted, too, that it is not always the people with official rank or position who count most in terms of influence. New ideas about health often stir up the antagonism of many ordinary people who feel that when their views on health are undermined they will suffer a

[2] Kurt Lewin, *Resolving Social Conflicts*, New York, 1948. p. 65.

Beware Of This Attractive Noxious Weed

By JACQUES BARRAU

The drawing shows the flowers, buds, leaves, fruit and one seed of a robust woody vine of the asclepiadaceae family. This is the Cryptostegia grandiflora *(Roxb.) R.Br., sometimes called "Indian rubber vine" although its actual country of origin is tropical Africa. It was once used as a source of latex for the rubber industry: the milky, sticky juice dripping from the stem when cut is quite characteristic.*

The mauve-purple flowers are very attractive, and the plant is now rather widespread as an ornamental climber in tropical countries. Actually, it is frequently confused with another attractive ornamental, Allamanda violacea, *Gardn. & Field. of the apocynaceae family. (It is a fact that seeds of* Cryptostegia *were introduced quite recently in New Caledonia from Tahiti as those of the* Allamanda *mentioned.) As a matter of fact, this* Allamanda *is grown in the area, as for example in New Guinea. The short, stiff hairs found on its leaves offer a simple way of distinguishing it from the* Cryptostegia, *which has smooth leaves.*

Unfortunately there are now clear indications that, in the driest high islands of the South Pacific (those receiving less than 100 inches of annual rainfall) Cryptostegia grandiflora *could become a dangerous noxious weed. It seeds profusely and its light seeds, bearing long silky white hairs at one end, are spread by the wind over wide areas.*

In several localities on the western side of New Caledonia it is now invading the pastures, and is very difficult to control. Most serious of all, it is highly toxic for cattle as it contains glucosides, which are a dangerous poison.

loss of status. Such people include local midwives, healers, magic workers and so on. If means can be found to bring these people into the picture, ways can be worked out by which they may save their self-esteem and help to disseminate knowledge that is medically adequate.

The realization that altering individuals means at the same time altering in some degree the culture in which they live should make the health education worker aware of the need to study and know the culture with which he is concerned. He should know the beliefs and attitudes of his communities intimately and sensitively. Without such knowledge all his skill in persuasion, all his study of medical knowledge is of little avail. For scientific medical knowledge is the same everywhere. What is variable is the pattern of resistance that each community offers to its acceptance.

The health education worker should see himself as the master of a sailing ship. He has a certain direction he wants to go. But without proper allowance for the winds and currents that affect his course he will fail to get there. By the intelligent use of the winds and by sailing on occasions with the flow of the tide, he can win through to port in the end.

Summary Of Principles

This rather discursive account of the social aspects of learning may be crystallized into the following principles:

1. Health education includes three types of change in human behaviour: change in knowledge, change in attitudes, and change in habits. Although it is the last that is of greatest practical importance, it cannot adequately be achieved unless all three changes happen together.
2. To bring about change in knowledge it is necessary to fit the new ideas to the "context" of understanding the learners already have.
3. Changing knowledge is not just a matter of rational explanation—it depends on changing traditional prejudices and attitudes.
4. Where necessary in the interest of improved health, new attitudes and motives have to be created.
5. This will often mean overcoming resistances and hostilities that basically arise from feelings that old security patterns are threatened.
6. These resistances can most often be overcome by striving for the fullest measure of voluntary co-operation.
7. They can be reduced by ensuring as far as possible that the new ways of behaviour are made as satisfying and pleasant as possible.
8. The quickest way to achieve this result is to work through the groups on which the individuals to be reached turn for support. By changing the group culture we create the conditions to which individual change can adapt.
9. It is often of advantage to study the power structure of a community and pay strategic attention to key figures within it.
10. Effective health education depends on intimate study and knowledge of the culture in which it is wished to bring about change.

Livestock, Pastures And The People

A review of pastoral problems in the South Pacific in relation to population and soil fertility.

By W. I. LAING*

Grazing stock at night is a management practice that assists in ameliorating a tropical climatic environment.

IN this brief review a number of subjects will be discussed. To deal with each one adequately would require many articles, each being as long as this one. The aim here is not so much to elaborate on the individual items, but rather to show how that superficial diversity may cloak the close inter-relationships of such matters as ruminant digestion, soil fertility, crop yields and the health and well-being of the people.

The more obvious difficulties to be overcome before pastoral farming can be widely embraced in the South Pacific are lack of capital, the shortage of suitable animals, and the general suitability of village plantings for grazing purposes. These are not, however, the most basic problems. Ruminant livestock could and should be used to overcome the most pressing social and material problems of the island people themselves — rapidly increasing populations, low dietary standards and dwindling soil fertility. A better understanding of the valuable role which cattle, goats and sheep could play in this connection is an urgent necessity.

Unfortunately the indigenes are not alone in failing to recognise the fundamental importance of grazing animals in a well-organised economy. The burden of ever-growing populations on depleted soils calls for the efficient mobilisation and utilisation of land, capital and livestock resources. In this article the various pasture and animal husbandry problems will be viewed against this background, and technical details perhaps unimportant in themselves will thereby receive a special emphasis seldom accorded them.

The majority of Pacific islanders are accustomed to meat, and since the advent of the European settler and the trade store, beef has become a familiar foodstuff. In spite of this there has been no parallel extension of knowledge relating to the care and management of the animals which provide this dietary item. Africans, Asians and Europeans are familiar with cattle, sheep and goats, having utilised their milk, meat and skins for many centuries. In the South Pacific these animals are still regarded as novelties, and such stock enterprises as do exist are largely controlled and operated by Europeans and Asians. In Fiji the close associations of Indians and Fijians is fostering a better appreciation of milk and milk products; elsewhere progress is slower, and is largely dependent on the stress laid by the educational authorities on the importance of animal protein in the diet.

In spite of many revolutionary changes which have occurred since European explorers penetrated into the Pacific, many of the old native traditions are jealously guarded. Festive occasions in most islands call for the presentation of a wide variety of gifts. The presence of cattle has not changed this ancient custom, but merely added another item to the list of donations. If a man owns a valuable bull he will guard it carefully and exhibit great pride in its ownership. He will also be overwhelmed with joy if he is "fortunate" enough to be able to present it as an offering at a feast. His "Mana" will certainly increase, but his days as a cattle raiser may be strictly limited following the loss of the herd sire. Familiarity with the prolific fowl and pig does not help overcome this obstacle, which is preventing the rapid building up of herds and flocks. Until the stock owners can learn to distinguish between essential breeding animals, and animals surplus to maintenance requirements, little progress can be anticipated.

North-western Europe is noted not only for the cultural achievements of its people, but also for the efficiency of its agriculture. In spite of relatively dense populations, industrialisation, and prolonged winters, agricultural production has been maintained at such a high standard that crop yields and animal productivity alike are superior to those generally obtained elsewhere. The coincident efficiency of stock and arable farming is no accident, but is a result of the close association of those two important phases of farm activity.

The term "alternate husbandry" has been coined to cover that form of farm management which involves the rotation of cash and food crops with pastures or forage crops. It has proved to be a most satisfactory method, as it not only yields a large variety of farm products, but also ensures that the soil fertility is maintained or even enhanced. The bovine digestion of grass might be considered inefficient by the physiologist but the ley farmer[1] is less concerned with this than the benefits which accrue in the form of better crop yields. The ecologist knows that grasses, legumes and grazing animals have a marked effect on the

* Chief Agricultural Officer, Department of Agriculture, Western Samoa. Mr. Laing's article is reproduced with acknowledgments to "Laufasi Ola", Official Journal of his Department.

[1] A "ley farmer" is one who makes use of "leys," i.e. short rotation pastures.

physical, chemical and biological nature of the soil, and both scientists and practical farmers are in agreement that soil fertility and crop yields are markedly influenced by the presence of grazing ruminants.

North-west Europe is the striking example of the success of wedding stock to crops, but recently this has also been demonstrated elsewhere, including the tropics. It might well be that the incomplete digestion of strand vegetation by goats may be a major factor in the rapid evolution of "normal" soils on the coral atolls. At any rate the advantages are so great that a closer study of alternate husbandry appears to be justified in all the Pacific islands.

Cattle, sheep and goats have distinctive feeding habits, but they share the honour of utilizing otherwise useless plants. Apart from the cereals and bamboos, grasses would be of little value to us were it not for these ruminants.

Unfortunately, in many island dialects, "grass" and "weed" are synonyms. Strictly speaking, weeds are unwanted plants which compete with desirable plants for food and light. Grasses which can be converted by this grazing trio into valuable human and plant foods can hardly be termed weeds. It behoves the modern philologist, therefore, to find or coin more appropriate words to express the vital inter-relationships between the Soil and Man; between the herbs of the ground and the herds of the grazier.

The luxuriance of the vegetation of the humid tropics finds no counterpart in higher latitudes, the cleared rain forest and the drier savannahs alike being capable of producing copious quantities of giant herbage. The utilization of this by grazing animals has been suggested, and even tried, but unfortunately neither temperate zone stock nor the practices introduced with them from a foreign environment, have proved markedly successful. The fundamental principles of grassland and stock management apply the world over, but variations in climate and growth rates call for special local modifications. Grasses grow quickly and give high yields. If uncontrolled, rapid maturation soon destroys the feed quality and palatability, so that high stocking rates and rapid defoliation become most essential.

Good fences, liberal water supplies, frequent handling of stock and the adequate provision of shade are only some of the factors which are concomitant on this grazing system. Several pasture species exist which are suited to intensive management, but unless it is practised their potentialities can scarcely be realised.

Both in the temperate zone and in the tropics, grasses grow better and produce more protein when allied with legumes, but to allow many of these latter plants to thrive, light is essential. Short, prostrate species will exist under close grazing as advocated, but twining legumes will survive even in spite of periods of rank grass growth. At times, as in very wet weather, pastures may unavoidably be allowed to grow too high, which would suggest that both prostrate and twining legumes should be utilised as the tropical clover equivalent.

Experiments in pasture improvement in New Caledonia have revealed that the vigorous "calopo" (Calopogonium mucunoides), first used as a cover and green manure crop, is also a useful pasture and fodder crop.

Advanced pasture management practices such as top-dressing, harrowing and overhead irrigation, are highly desirable even though the times, rates and methods of applications may call for certain modifications. On the dry leeward coastlands of Hawaii, Hosaka and Carlson (1952) have shown that land which could not support more than one beast to ten acres has been converted into grazings capable of supporting two or three cattle per acre. This is a 3,000 per cent increase which was achieved by utilizing sprinkler irrigation, better pasture species and top-dressing. It may not be possible to fully reproduce these striking results elsewhere, but they should serve as an example of what can be done by applying enlightened temperate zone farming methods to certain areas of the tropics. Two or three cattle to the acre would be a phenomenal carrying capacity outside of the torrid zone.

It has already been mentioned that goats, sheep and cattle all have distinctive feeding habits. This is not the complete story, as the two major species of cattle differ markedly between themselves. The Indo-African breeds (*Bos indicus*) have much more catholic tastes than the European breeds (*Bos taurus*), and to some extent resemble the goat. Sheep require short herbage, and like cattle in general, need their feed to be immature and succulent. Goats require nutritious feed also, but will ingest in a large variety of leaves, stems, twigs and seed-heads in addition to young grass. These differences present a number of difficulties for the grazier. On the other hand, utilised wisely, they can provide for the control and conversion of a large variety of plants at differing stages of maturity. There seems little doubt that running all three (or four) forms of stock on the same land will increase the overall efficiency, and allow for a large measure of control over both the herbage and the internal parasites it harbours. Sheep, cattle and goats should not be regarded as alternative or competitive classes of stock, but rather as complementary forms whose efficiency is partly dependent on the association with the other species.

European breeds of livestock were evolved in Europe and their high productivity is partly due to careful breeding and selection for that environment. Insofar as the humid tropics present certain differences from European conditions, so, too, highly-selected breeds are less adapted for production in the Pacific islands than stock not so intensely selected, or selected in hotter climates. As soon as this is recognised, the fictitious value of pedigree European stock for the tropics will be more clearly understood.

Highly productive purebred animals are valuable in their own true surroundings as the continued productivity of their progeny is largely assured. Under any other circumstances their new value has to be assessed independently, and the chances of their suiting other environments is inversely proportional to the intensity of selection which has been used in the evolution of the strain or

breed. These considerations are of paramount importance in the stock importation programmes which many Pacific territories are contemplating.

In Africa, India, and the Middle East there are many breeds of livestock which can withstand tropical temperatures. They can be regarded as potentially productive animals suitable for introduction to the Pacific. There is little likelihood, however, of this potential being realised immediately, as the backward state of animal husbandry in these warm countries has permitted the evolution and spread many disease organisms not encountered elsewhere. Any programmes for stock importation and improvement must take cognizance of these facts, and stringent quarantine safeguards are needed before the South Pacific can utilise the heat tolerance and adaptability of these stock.

The availability of suitable productive animals is severely limited by these two major considerations, disease and heat intolerance. There are, however, a few channels still open, and certain sources of supply available, in countries from which stock can safely be obtained.

Firstly, in the case of cattle, the dual purpose breeds, and breeds of mixed origin such as the Holstein-Friesian, have a much greater variability than in the case with the single purpose purebreds. By utilizing high grade animals, or dual purpose types, we are widening our chances of obtaining high production under conditions differing from the point of origin of the breed.

Secondly, we can utilize stock which although present in Europe, America, Australia or New Zealand, are partly derived from the primitive breeds of hotter lands. A full list of such animals would occupy a good deal of space, as breed origins are often rather vague and uncertain, but we can mention here the Jersey and Santa Gertrudis cattle, Anglo-Nubian and Angora goats, and Wiltshire Horn and Dorsian sheep. Some of these breeds have already proved so well suited to the tropics that an export trade is being developed by stud masters in a number of countries. Some at least of these breeds could be utilized in the near future in the Pacific islands.

The pressing problem is to provide food from soils of fast-falling fertility. Efficient modern farming methods are called for, and so far no techniques have been evolved which surpass ley farming or alternate husbandry in the maintenance of soil productivity. In one hundred years the Pacific islanders have learnt a great deal from their contact with Europeans and their way of living. In spite of this, they know little of efficient grazing methods or enlightened animal husbandry. If alternate husbandry is to be practised this state of affairs must be changed. Pigs and poultry are well known and play a prominent part in feasts and ceremonies; they also compete with their custodians in the reduction of an ever-dwindling reserve of food calories.

This is an urgent problem, and presents a major task for all who can aid in its solution. Another hundred years of the present exploitation of soil fertility may well precipitate disaster. Social, economic and political factors are probably involved, but the most outstanding need is for the solution of current technical problems, and the extension of already proved pastoral practices. An old Flemish proverb states:—

"Point de fourrage, point de betail,
Point de betail point de fumier,
Point de fumier, point de fourrage."
("Without forage, there can be no cattle.
Without cattle there will be no manure.
Without manure there will be no forage.")

In any cropping programme, plant food is removed. Ruminants can largely replace this at the same time as yielding valuable human food. It is the duty of agricultural advisers and administrators alike to ensure that in the Pacific, as elsewhere, the raising of cattle, sheep and goats is fully encouraged so as to ensure the well-being of future generations.

REFERENCE: Hosaka, E. Y., and Carlson, N. K. (1952), "Irrigated Pastures for Hawai'i," Univ. Hawai'i Extension.

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This small dairy on the outskirts of Suva is typical of a number established in a few Pacific territories. However, milk output is in each case only a small fraction of local needs.

Milk For The Islands

In this article the author makes the proposal that marked protein deficiences existing in the diets of some Pacific island peoples could best be met in the first instance by making available to them processed milk and milk products.

By T. C. LONIE*

THERE is general agreement that in most Pacific islands, the principle shortage in the average diet is in protein and especially in protein-rich food which is not only palatable and nutritionally adequate but also cheap enough to be within reach of that part of the population which needs it most.

The final solution to the problem will certainly vary from place to place, but eventually satisfactory protein of some sort will be found and used. Fish, meat and milk supply the type of protein of most value to human beings, and it is precisely this kind of protein which is particularly lacking in many island diets.

Schemes are already in hand to increase fish and meat supplies, but the proposals are clearly long range and unlikely to make any material difference to the overall amount of protein available for a long time. It therefore might be of value to consider a milk supply not only from the long range angle, but also as at least a partial solution on a short term basis.

From the long range point of view the conditions which are favourable to the establishment of a cattle industry may allow the establishment also of a liquid milk supply, but this by no means follows for various reasons into which one need not enter here. Some liquid milk will undoubtedly be available as a consequence of cattle raising, but costs of production and difficulties of supply and distribution will interfere greatly with consumption.

However, there is a means whereby the protein—the most valuable nutrient in milk—can be made available to island peoples provided that it can be presented to them as a desirable addition to their diet, that they are able to pay for it, and provided marketing can be arranged. This is by the use of processed milk derived from the plentiful supplies of countries where the manufacture of milk products is a major industry.

In the Pacific, New Zealand and Australia come immediately to mind, but the large dairy industries of other countries are also concerned. Suggestions have already been made in the press that the so called 'dumping' of dairy produce from Northern Europe on the United Kingdom market may, in due course, compel Pacific producers to look for new markets. It might even pay these countries under some circumstances to subsidize their products during an interim period in order to establish a new market.

Types Of Milk Available

Let us now consider the types of milk available.

The proper management and control of a liquid milk industry to ensure that the customer receives a product of good quality, free from disease-producing bacteria, is too large a matter to be dealt with here. Suffice to say only that in tropical circumstances and conditions, the care in handling milk from the cow to the consumer, so essential in temperate climates, must be even more meticulous in order that the consumer may receive a satisfactory product.

Nevertheless, small dairying businesses have already been set up in certain urban areas in the Pacific, and fresh milk supplies have been made available to local residents. These are commendable efforts carried out in the face of management difficulties which are seldom appreciated by the consumer. One such concern established in Tahiti is described in an article appearing in the *Quarterly Bulletin* for April 1957. It gives much useful information, particularly regarding management of the dairy herd.

However, these concerns touch only the fringe of the problem; their products are consumed only by a small fraction of the population, probably mostly non-indigenous. The supply in Tahiti clearly does not meet the local milk needs, as the author of the *Bulletin* article referred to points out, and indeed the production figures given amply demonstrate.

The liquid milk industry *will* undoubtedly expand in the Pacific, but it faces many difficulties, and for a long time to come the majority of the people will need to depend on imports of dried, evaporated, or condensed milk.

Which kind should be used depends upon a variety of circumstances, but it would be better to clear our minds first of all about the common types of milk available. Leaving aside milk preparations for use in special circumstances and conditions, the main varieties are four in number, namely:

1: **ORDINARY DRIED WHOLE MILK**, which as 'dried full cream milk', or under other description and a variety of trade names is simply milk from which enough water has been removed to produce a powder, or a flaked product, which, mixed with the appropriate amount of water (usually one part of powder to eight parts of

* Public Health Officer, South Pacific Commission.

water) produces a milk for all practical purposes of identical composition with the original product. (One gallon of whole milk produces 1¼ to 1½ lbs. of powder.) The palatability, appearance, and acceptability of such re-constructed milk depends upon the exercise of normal reasonable care in making it up, exactly the same sort of care as is needed to mix any other soluble powder properly with water.

Dried milk powder, properly prepared and stored, should contain very few bacteria. Its low moisture content if maintained helps to keep the bacterial count low, but of course loose dried milk will quickly absorb moisture and also pick up from the air and from handling, considerable bacterial contamination. The powder should, therefore, be kept in an air-tight tin until required, and bulk trade containers should never be so large that the contents cannot be disposed of in a day or so.

Dried milks (especially full cream milk) depending on the original quality of the milk, the method of manufacture and the conditions of storage may occasionally develop such faults as rancidity, offensive odours, decreased solubility, or a tallowy flavour.

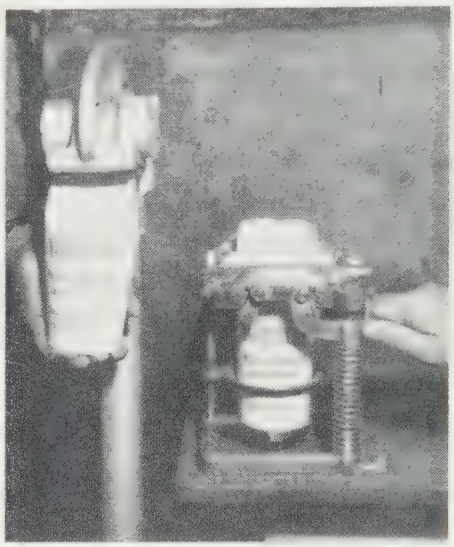
However, reputable manufacturers are aware of the dangers, and in their own interests normally take all reasonable precautions in the processing of the milk, and in giving directions as to its proper handling. Where defects *do* develop they are commonly due to such factors as the retention of the product for too long a period from the date of manufacture, storage at too high a temperature, or storage in un-sealed or non-airtight containers. Good quality roller-dried milk under good storage conditions may keep for six to twelve months without developing rancidity or tallowiness. Spray-dried milk keeps for three to seven months. (The terms 'roller-dried' and 'spray-dried' refer to methods of manufacture, the first being drying of a thin film on heated rollers, and the second drying of a fine milk spray almost instantaneously in a current of hot air.)

2: **DRIED SEPARATED (SKIM) MILK.** This is milk from which the fat has largely been removed but which still remains a valuable food product since it contains all the protein (casein and lactalbumin) of the milk, all the carbohydrate (lactose) and all the mineral salts. Its principal food value is in its protein content. After the cream is taken off to make butter, the resulting 'skim' milk is dried in the same way as whole milk. Approximately 1 lb. of powder is derived from 1 gallon of skim milk.

Dried skim milk keeps well, better than dried whole milk.

3: **EVAPORATED MILK** is the term generally applied to unsweetened condensed milk, which is milk from which 65% of the water content has been removed. It is sterilised after being condensed and marketed in hermetically-sealed cans.

It has considerable advantages over other types of milk in that tins are normally small enough in size to enable the contents to be used without being exposed too long to the risk of contamination. Being sterilized in manufacture, it will in normal circumstances keep indefinitely, and has generally a negligible bacterial content. Commercial 'sterilization' is an approximate term. In fact, up to 20% of cans have been found to contain spore-forming bacteria, but these are not normally of a disease-producing type, and the standard rule that any canned product exhibiting spoilage in any form should be discarded will prevent trouble. 'Evaporated milk' usually bears that description on the tin.



In the tropics the care in handling milk from cow to consumer, so essential in temperate climates, must be even more meticulous. The Nacocolevu Agriculture Farm at Sigatoka, Fiji, sells milk in hygienic cartons, shown here being sealed and stapled.

4: **'CONDENSED MILK'** is the term usually applied to milk which is not only condensed but has sugar added to it. The methods of processing are in order, 'forewarming', addition of sugar, condensing, cooling, and canning. 'Forewarming' is usually combined with *pasteurization*, but sweetened condensed milk is never *sterilized* during manufacture, though the high sugar and low moisture content assist in preserving the article from spoilage. Sugar is added at the ratio of 16 to 18 lbs. per 100 lbs. of milk, which is a considerable amount, and is a principal reason why the temperature in the condensation process is not permitted to rise high enough to caramelize the sugar with consequent changes in taste and appearance of the milk. However this lack of sterilization, sometimes contamination in the sugar, plus the long slow process of condensation, and the sweet sticky nature of the product make contamination easy, especially by gas-producing bacteria and gas-producing yeasts to be found everywhere in the atmosphere.

Nevertheless, sweetened condensed milk prepared under good conditions and in air-tight tins (preferably vacuum-packed to diminish the available air in the tin) has very good keeping qualities so long as the tins remain unopened, and are kept at a reasonably low temperature. There is unfortunately a tendency to keep condensed milk for too long a period after the container has been opened, and the risks of contamination and spoilage are thereby increased.

Vitamins In Milk

Vitamins in processed milk are, to some degree, affected by the process used. Vitamins "A" and "D" are not diminished except in skim milk, where they are removed with the fat. Vitamin "B" is reduced by 20% and vitamin "C" is much diminished. However, the latter is normally found in very small amount in milk, which could never be regarded as an adequate source of vitamin "C" in any case.

For all practical purposes, then, the processing of full cream milk does not significantly impair its quality as a source of vitamins. Skim milk is a special case. It is not intended as a substitute for milk but as a protein-rich dietary supplement.

Economic Aspects: Cost To The Consumer

Of the types of milk described above, full cream milks are the most costly, and must be regarded as direct substitutes for fresh milk. Apart from their cost, their use as an addition to ordinary dishes would probably be difficult in many instances on account of their fat content.

Since our concern is with supplementing deficiencies of protein in the diet generally, the product most suited to our purpose is skim milk powder—protein rich, without fat, and derived from a cheap source, namely the separated or skim milk remaining after the cream is removed. However, though cheap because of the particular circumstances of production, the price of skim milk powder is not negligible.

The cost of all foods originating and processed in a country other than that in which they are finally sold to the consumer, is bound to be higher in the latter than in the former, always provided that normal price mechanisms are not interfered with by duties, subsidies, etc. However, such interference,

especially in relation to subsistence foods, now seems to be the rule rather than the exception, and a method of controlling consumption by taxes and duties, can equally be manipulated to encourage by subsidies the consumption of foods necessary for health.

This method of ensuring that a particular population has made readily available to it in adequate amounts the foods which are necessary for health, has been adopted in time of stress in a number of countries.

It has particularly been the method by which babies and young children have been cushioned against wartime food shortages, and in this case misuse has been avoided by supplying the article through government channels and in rationed amounts.

Where a whole population needs dietary supplement, and especially protein, and there is a sufficiently adequate retail trade organization, it might be simpler for the government concerned to fix a retail price for the product, and to meet, probably by arrangement with importers, the difference between cost and sale prices.

The sale price, if the scheme is to be a success, must be such that the protein food is not only cheap, but cheap enough to allow those earning a very low average income to purchase it. It may be that even this would leave the very poorest unable to buy the food. For these, supplies could be made available free either directly from a government health centre, or officer, or from normal stocks by means of exchange vouchers. The permutations of such a system may be many.

Criticism of a system such as has been suggested may be made on the ground that, assuming the supplement to be necessary, it would be better to supply it directly to known needy persons and families rather than to leave it to chance demand, and to take the risk that short supplies might mean that there was unfair distribution and the neediest people did not get it. There is of course such a risk, as there is one that the whim of an individual storekeeper might deprive people of a certain neighbourhood of the benefits of a cheap and necessary food. But ways could be devised for obviating these difficulties, and on the whole it has seemed to be more desirable to use normal trade channels to bring necessary foods to the people if any large numbers are concerned.

Economic Aspects—National

Agricultural and livestock programmes will be a natural development in the Pacific, and each should assist in augmenting current and local food supplies. However, they will take a long time to produce material change in the diet of the people as a whole.

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The development of the Territories of the South Pacific is an example of the spirit of the pioneer builders of all nations.

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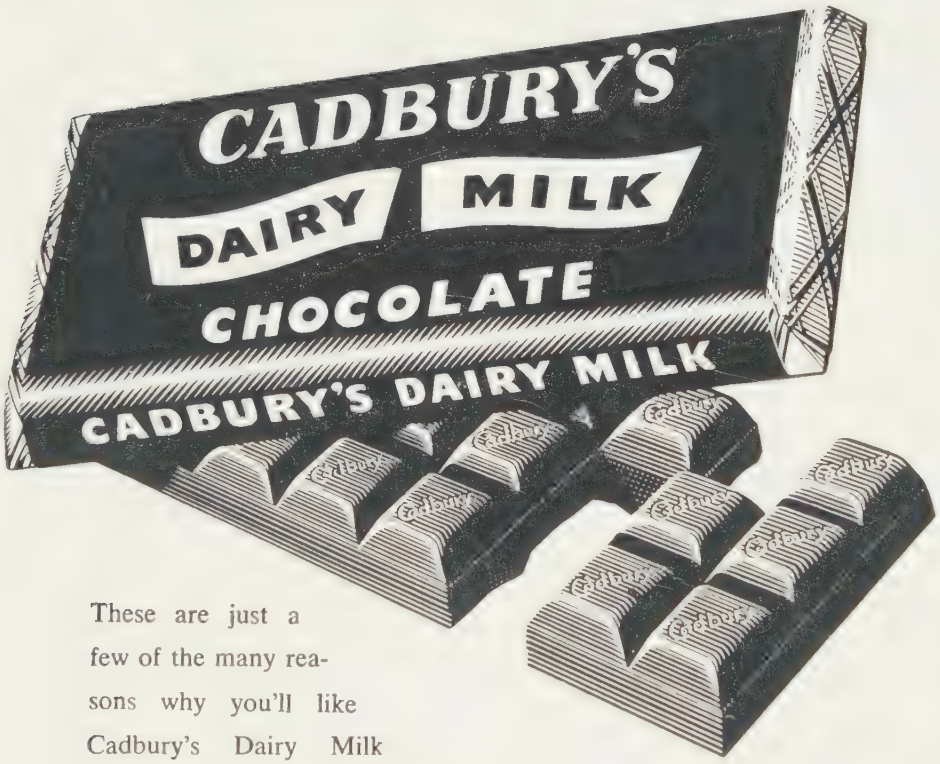

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Meanwhile, ready to hand, here is a valuable food. What about stocks and price? Skim milk was for many years—and to some extent is still—an embarrassment to the dairy industry of a number of countries. As far as possible it is used for stock feeding, but this does not get rid of it all. Dairy factories find it a nuisance, and in some places compel the milk supplier to take away an amount of skim milk equivalent to the amount of milk he has brought to the factory.

The production of skim milk powder has been of assistance, but the London *Times* of March 28 last, in a report, states that in 1957, more than 12 million gallons of skim milk were thrown away, though it was hoped in the current year to reduce the amount to 4½ million gallons. This was by stimulating the sales of skim milk powder to stock feeders, by increasing exports, and by advertising the virtues of milk in general. This referred to the United Kingdom Milk Marketing Board's area. It may be said in passing that assuming 1 lb. of skim milk powder per gallon of milk, this gives us 12 million lbs. of powder for the waste skim milk mentioned above. Of this, 35.8 per cent. will be protein, i.e. 4,296,000 lbs. of milk protein for 12 million gallons of waste skim milk. A sobering thought!

At the same time the dairy industries of New Zealand and Australia are distressed at what they term 'butter dumping' by a number of other countries on the British market. For every pound of butter there must be an equivalent of skim milk and one wonders in what way it is being disposed of in countries other than Britain. If the position in Britain is to be taken as a guide, there must be substantial surplus elsewhere.

Advocacy of the diversion of surplus skim milk to protein-needy populations is neither new nor revolutionary. Some surplus skim milk is already finding its way in the dried form to countries with great dietary needs, notably via the agency of the United Nations Children's Fund (U.N.I.C.E.F.) and the World Health Organisation (W.H.O.), and to special population groups. This is excellent humanitarian work, productive of much good in the recipient countries.

But there are a few territories in the Pacific with protein needs as great as may be found anywhere in the world. As it happens, most if not all of the metropolitan governments responsible for these territories are precisely those which would appear to have milk protein surplus. It would seem that some system should be devised whereby, on as large a scale as may be necessary, such surplus should be applied to meet dietary deficiencies of dependent peoples.

Naturally, the matter of cost is im-

portant, but is should be borne in mind in considering this that the territories chiefly concerned are already heavily subsidized by the countries responsible for their welfare. It thus becomes a matter of simply deciding whether a proportion of the funds available ought to be spent in promoting and subsidizing the use of milk protein by those who are in such need of it.

Certain it is that the addition of a few extra grams of protein to the daily diet of some island groups, especially in New Guinea, would make a tremendous difference to the nutritional picture almost immediately, and the dried skim milk powder might even remain as a common article of diet in demand and of commercial significance long after the major protein necessities had been met by agricultural or other development.

Educational Aspects: Taste And Demand

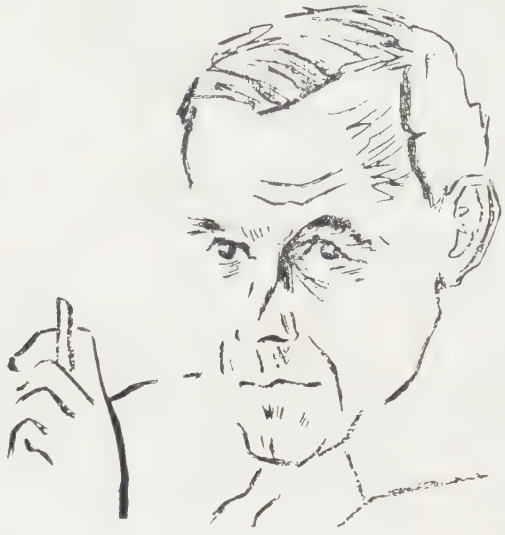
Whatever the means by which the protein food is brought within the economic reach of the people for whom it is designed, all plans will fail if in fact the prospective consumers do not like it, or do not know how to use it, or if its preparation requires complicated procedures.

Apart from the use of full cream milk and the ordinary condensed varieties which will have special uses in the feeding of infants and young children especially, the major protein deficiencies of the communities with which we are concerned can be met by skim milk powder, which incidentally in the course of manufacture can be cheaply and easily fortified by the addition of vitamins, minerals or salts, should the diet be deficient in these constituents.

It is in some ways a mistake to call this product milk at all, the name calling up a host of misconceptions and prejudices in relation to its use. A name such as say 'Stamina Flour' or 'Protein Flour' might be better, but any name—and there might be several—must be easy to pronounce, and should if possible convey a suggestion that the article is desirable and of value. Suitable dialect words varied to suit the particular language group might help here.

The incorporation of the product in local dishes would be most valuable, and it would be an interesting and valuable exercise for dieticians to experiment in the matter and for those who control their activities to encourage such experimentation, as well as by providing the materials required as by arranging for suitable consumer groups in which to study such important problems as palatability and acceptability in general.

There is a crying need for fundamental trial and error experiment by intelligent and adaptable workers in the introduction of skim milk powder to



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native foods in a way which will be attractive and acceptable to the prospective consumers.

In short, the dietician will need to get down to the level of the village housewife, using her utensils and equipment and means of cooking, in order to do this job. She will need to adapt herself to the absolute or seasonal shortages of the basic foodstuffs. She may have to cope with conditions in which even water is a scarce commodity to be carried long distances.

With this equipment she must then introduce her protein supplement to the dishes normally eaten by the people concerned, and must constantly test 'consumer reaction' before any new recipe is publicly advocated. It is of the utmost importance that an unfavourable reaction to the use of the supplement should be avoided, and it is better in this particular connection in the early stages to allow consumer demand to set the pace, rather than to force the product on an uninterested and unwilling people. At the same time it is important that the flicker of interest and demand for the product should not be allowed to die because supplies are not readily and immediately available. It may be extremely hard to light the flame again if the first gleam of interest has been snuffed out or neglected.

Conclusion

The introduction of skim milk powder to protein-deficient diets is not put forward as a final solution to what is agreed to be a serious subsistence and nutrition problem. It is clearly desirable and necessary that the promotion of an adequate and varied local subsistence economy should be at least part of any final policy, and doubtless the major part.

One must however be realistic in these matters. No civilized community, except possibly the very largest agglomerations of peoples, lives entirely on its own communal resources. If it did there would be no international trade. But there is a kind of mystique which, accepting this for commerce other than in food, has an inward and unshakeable conviction that if only the right things are done and the right teaching accepted, a man may live independently on the products of his own garden. Whether he can or cannot the fact is that, at a very early stage in his development, he does *not* do so except in the most dire necessity, and will no more do so for choice than will those who proclaim but do not practise this gospel. So import of foods unavailable locally but desired, will continue to expand, in so far as the export of surplus commodities can support it.

It may be therefore that skim milk powder may become, in course of time, not only a short-term subsidized aid to a sub-standard diet, but finally in fact

an integral and established part of the normal daily food whose purchase will become a necessary preference over some of the less necessary—or indeed completely unnecessary—things which attract the spare cash of unsophisticated people now. The desirability of such an outcome and its normal possibilities should not be overlooked by the milk surplus countries.

SUMMARY

1. *The proposal is made that the immediate protein deficiencies in the diet of certain Pacific Island peoples can best be met in the first instance by making available processed milk and milk products.*
2. *There are four principal types of processed milk:*
   (a) Dried whole milk;
   (b) dried separated (skim) milk;
   (c) unsweetened condensed milk;
   (d) sweetened condensed milk.
3. *Whole milk products substitute for ordinary liquid milk especially in the feeding of infants and young children;*
4. *Dried (separated) skim milk lacks fat but is rich in first class protein and is generally cheap because the supply of skim milk in any form is greater than the demand;*
5. *It is a product which keeps well, and can be incorporated in many foods;*
6. *The promotion of the use of dried skim milk is suggested as an immediately useful solution to the protein shortage problem, though not necessarily a complete or permanent solution.*

Literacy In The South-Western Pacific

LITERACY In The South-Western Pacific is the title of the first part of a report by Dr. Karel Neijs, former Literacy Adviser to the South Pacific Commission, that has now been produced in mimeograph form. Copies, in English or French, are available on request.

The report provides a general survey of the present state of literacy in Netherlands New Guinea, Papua and New Guinea, British Solomon Islands and the New Hebrides, against the varying educational, linguistic and sociological backgrounds, and goes on to make suggestions for possible programmes of work in this field.

The second part of the original report is a precise account of an experimental course in adult literacy teaching conducted by Dr. Neijs in collaboration with the Department of Education in Papua and New Guinea, and includes samples of the teaching materials used in the course.

This part has just been published in the Commission's Technical Paper series under the title, *An Experimental Course in Adult Literacy* (Technical Paper No. 114).

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FAO Forms Coconut Study Group

(Continued from page 38)

that the results obtained by the South Pacific Commission in the field of rhinoceros beetle control would be published. During the discussion, the Philippines delegate offered all facilities to FAO, including a contribution to a special fund, to set up a regional research centre for the development of the control of diseases and pests of the coconut.

The Group again stressed the importance of international co-operation when discussing the promotion of basic research. It noted that it appeared essential that, before FAO could initiate work in this field, governments should inform the organization of any research work being carried out or planned in member countries. The Group therefore recommended that reports on these lines be submitted to FAO by 30th June 1958.

It considered that it was too soon to set up an International Coconut Bureau (a technical organization for advancing knowledge on the coconut) at this stage. It was emphasized, however, that coconut-producing countries would benefit from a quicker exchange of scientific and technical information than present facilities permitted. The Group therefore requested the appointment by FAO of a highly-qualified expert to undertake this work. Should necessary funds not be available under the normal programme, the Group suggested that interested governments take the necessary steps to request the appointment of this expert under the 1959 Expanded Technical Assistance Programme.

Germination And Growth Of The Coconut

(Continued from page 39)

lings were found to use up the endosperm much more quickly than the plants with slower growth.

Thin-husked nuts with thickness of husk averaging 2.9 cm. and below germinated earlier and produced more seedlings with more leaves and roots than thick-husked nuts of 3.0 cm. thickness of husk and above. With the latter, the shoots were more often distorted. This superior growth may have been influenced by the greater content of meat.

Seedlings grown from nuts with a setting percentage of 35.5 per bunch and above, germinated earlier, and gave a higher percentage of germination. The seedlings produced had more leaves and longer roots than those from nuts obtained from bunches of a low percentage of setting (18.5 and below). The meat was almost used up in all the nuts from the high-setting bunches, while on the other hand, only a small amount of the meat of nuts from poorly-setting bunches was consumed. Nuts gathered from heavy bunches of ten or more nuts likewise germinated earlier and produced seedlings which were taller, heavier, and with a much better root system than those from light bunches.

Light nuts weighing 0.95 to 1.35 kg. germinated much later than heavy nuts (1.85 to 2.45 kg.) and produced shorter seedlings with less roots and leaves. The mean difference of the weight of seedlings was not taken into account, because before planting a very marked difference existed in the weights of the nuts in the two plots. The difference, however, in the increase of weight of the seedling from a nut was statistically insignificant. Examination of the meat content showed that the meat consumed by the seedlings of light nuts after 211 days was much less than that consumed by those of heavy nuts.

The position of the nuts on the bunch, such as on the ventral and dorsal sides, had no influence on the time and percentage of germination. Seedlings of nuts from the dorsal side produced more leaves and were heavier than those from the ventral. Seedlings from the ventral side, however, were taller and developed more roots than those from the other batch. Seedlings from the top nuts produced more leaves and roots than those from the bottom. The middle nuts germinated more quickly, but gave a much lower percentage of germination than either the top or the bottom (Umali, 1940).

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PACIFIC READING

Material in this section is contributed by the South Pacific Commission Literature Bureau. Any enquiries relating thereto should be directed to Box 5254, G.P.O., Sydney, Australia.

Notes and News

Simple Methods in Timber House Construction for Cook Islanders. This simply-written, well-illustrated 28 page handbook of basic house-building techniques has been prepared by the Cook Islands Social Development Department to meet the demand for information on the use of imported building materials. At present there is an increasing trend in the Cook Islands towards the construction of wooden frame houses with concrete floors and iron roofs: this book, then, represents a determined effort by the Department to acquaint the "amateur" house-builder with the correct handling of these materials and to ensure that only structurally sound buildings are erected.

Although primarily written for Cook Islanders the textual matter is in no way localised, and the information given would be equally applicable to most other areas of the Pacific.

The book is divided into nine sections covering the following topics: (1) *Setting out the Building;* (2) *The Foundations;* (3) *The Concrete Floor;* (4) *Timber Wall Framing;* (5) *Assembling the Wall Frames;* (6) *Ceiling Framing;* (7) *Roof Framing;* (8) *Windows and Doors;* (9) *Wall Linings.*

The text has been kept as simple and as non-technical as possible and is well illustrated by clear line drawings. The two specimen pages reproduced below show the style and appearance of the book.

This book is a good example of small-book production using the multilith offset process and a modern electric typewriter to set up the text. Single specimen copies with details of production costs are available from this Bureau. We shall welcome enquiries from territories interested in the production of similar booklets.

New Book List. The first of the Literature Bureau's mimeographed book lists referred to in "Notes and News" for January last is now ready. Entitled "Some Recent Acquisitions", this list gives details of recently-published books which merit consideration in connection with the reading needs of island peoples.

The facts concerning each book reviewed have been presented in a uniform manner covering *Title; Author; Publisher; Series; Reading Level; Pages; Price;* followed by *Remarks.* The remarks have been kept as brief as possible. In adopting this style of presentation we have kept in mind two types of officers — (1) those whose days are so fully occupied

shown in diagram 1 can be made from 2" x 2" pegs and 3" x 1" battens. The pegs must be driven deep into the ground and if necessary braced as well to prevent any movement.

2. Construct profiles at the remaining corners, making their tops level with the top of the first profile. The correct levels can be obtained by means of a spirit level placed on a length of timber which has a straight edge or on a tightly drawn cord.

3. Mark the position of the outside of one of the long walls by means of a cord stretched between nails in the profiles at each end.

4. Next mark the position of a second wall adjacent to and at right angles to the first, using a builder's 3:4:5 square to obtain the correct right-angle. A 3:4:5 square as shown in diagram 2 can be made from 1" timbers to any size provided the lengths of the sides are in the proportion of 3 to 4 to 5. A suitable square would be one with sides 4½, 6 and 7½ feet long.

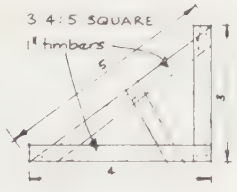

Diagram 2

5. Mark out the positions of the remaining walls and check the building for square along the two diagonal distances across the building. The diagonal distance is the distance between opposite corners of the building: in diagram 1 between A and C, and B and D. The building will be square when the measurements are equal.

6

Section 2

THE FOUNDATIONS

Using the profile lines as a guide, dig the trenches for the footings. The trenches should be eighteen inches deep and fifteen inches wide for concrete footings, and both eighteen inches deep and wide for lime foundations. The bottom of the trench should be made level, by means of steps on sloping ground if necessary. See diagram 3.

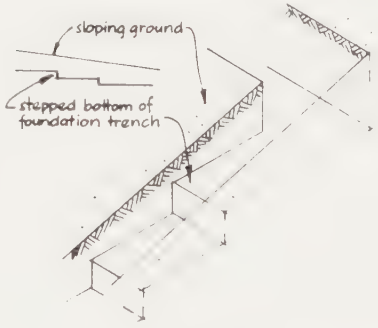

Diagram 3

If the trench is in loose soil, fix boards along the sides to prevent any earth falling in. In order to mark the top of the footing, place pegs about four feet apart along the sides of the trench at eight inches from the bottom for concrete footings and fifteen inches for lime footings.

Fill the trench to the level of the pegs with concrete or lime. See diagram 4.

OXFORD ENGLISH COURSES

FIRST READING BOOKS

A series of supplementary readers is now being produced for use in conjunction with the *Oxford English Course for Papua and New Guinea.* The first two books in the series are:

WHY COCKS CROW	3/-
TUI LIKU AND THE GIANTS	3/-

The books are forty-eight pages long, contain eight pages of black and white illustrations, and are attractively bound in decorated manila. Miss I. V. Frémont, the well-known author and adaptor, has chosen the stories from various parts of the southern Pacific area, and tells them expertly.

Their vocabulary is based on the words learnt in the *First Book, Second Book,* and *Third Book* of *Oxford English Course for Papua and New Guinea.* They would therefore be suitable as readers to accompany either the *Fourth Book* or the later stages of the *Third Book,* but could, of course, also be used with any English course book of a similar grading.

Other books of the same difficulty are:

TOM THUMB	1/3
ROBIN HOOD	1/2
NINE FABLES	1/2
TANGGA TALES	1/3
THE THREE WISHES	1/3
THE ANIMALS' BAND	1/11
THE GOOD LITTLE MEN	1/2
SEVEN AFRICAN TALES	1/3
THE TORTOISE OF KOKA	1/3
THE WOMAN AND HER SON	1/11
THE GOAT AND THE HYENA	1/3
CINDERELLA AND RAPUNZEL	1/2
P'ING SHU THE STORY TELLER	1/3
THE KING WHO LOVED RIDDLES	1/3
THE PRINCE WITH THE GOLDEN HAIR	1/2

All prices are quoted in Australian currency

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that little time can be devoted to studying reviews of great length, and (2) those who are unable to inspect a book before purchasing it, and so must inevitably rely on reviews to a great extent. While we think this form will meet the needs of most users, we are open to suggestions on this point and should welcome any comments or suggestions for improving the usefulness of this book list.

Unesco Publications. Attention is drawn to two recent Unesco publications which are of exceptional interest to anyone who is concerned with producing reading materials for the islands. They are *Periodicals for New Literates: Editorial Methods and Periodicals for New Literates: Seven Case Histories,* being No. 22 and No. 24 in Unesco's Reports and Papers on Mass Communication Series.

A First Hygiene Book Reprint. Stocks of the second printing of this widely-accepted book have now been exhausted and a further reprint of the New Hebrides and Papua and New Guinea editions is now being considered to meet future demands. Missions, schools, and health workers desirous of purchasing copies of this book, which is priced at A.3s plus postage, are requested to forward their orders to the Literature Bureau, Box 5254, G.P.O., Sydney.

Recording of Solomon Islands Music

THE South Pacific Commission has in the past two years made a number of gramophone records of Pacific Islands music from tape recordings contributed to its broadcast recordings service (described in the April 1957 issue of the *Quarterly Bulletin.*)

Two items by the Simbo Island Bamboo Band in the British Solomon Islands Protectorate were among the first to be transferred from tape to disc. The songs are "Beautiful Body" and "Living Alone In The Sunset", and the instruments used by the band of about sixty players are guitars and bamboos. The bamboos are of different lengths and diameters, each having its own note. Some are pounded on the ground, others are hit with the hand or with a slapper to make the resonance come through the neck of the bamboos, and the guitars are tuned to the bamboos. The tunes are based on traditional rhythms, but the words of the songs were written in recent years.

The original tape from which the two songs were taken was made available to the Commission by Mr. N. K. Wallis of Sydney, who recorded a considerable amount of music for use in a documentary film on the Solomon Islands which he made several years ago. Both Mr. Wallis and the Western Pacific High Commission were anxious that at least some of this music should be recorded in permanent form, because the indigenous music of the Solomons was little known outside the territory. The South Pacific Commission agreed to have two 78 r.p.m. discs processed as part of its broadcast recordings service, and the Simbo Bamboo Band items are perhaps the most interesting of those selected for transfer to disc.

The recording has been played in the Solomon Islands Broadcasting Service's sessions for island peoples, and copies have been sold to Europeans and islanders by the B.S.I. Trading Corporation in Honiara. Copies of the disc have also been supplied to the Administration of Papua and New Guinea for possible use in their special broadcasts for native people, and to a commercial firm in the Cook Islands which is considering the possibility of marketing them in that territory. An excerpt from the disc was played early this year in the Australian Broadcasting Commission's Breakfast Session, which is broadcast by most A.B.C. stations in Australia and by Radio Australia. It has had the effect of reviving interest

How It Works Series

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The author, in the first four books of this new series, explains in simple language things which children see in everyday use based on scientific principles which are within their grasp. These are books for the children themselves to read for information. 1. Magnets. 2. Pulleys. 3. Levers. 4. Wheels, Ramps and Rollers. *Illustrated. 1s 9d each.*

GOOD HEALTH THROUGH GOOD FEEDING

E. B. Cheek

A guide to good health through a balanced diet has been written for use in the tropics. The author has set out in simple words the value of the different sorts of food for the body; why some people, such as growing children, pregnant women and nursing mothers, have extra need of some kinds of food, and what they should try to eat to satisfy it. *Illustrated. 1s 4d*

CARE OF MOTHER AND BABY

C. Elaine Field

The book has been prepared primarily for senior schoolgirls and less literate mothers in Malaya and in other tropical areas. The simply-written text covers the care of the expectant mother and the management of the infant, and is well illustrated with drawings, charts and tables. *2s 6d*

GRIFFIN READERS

S. K. McCullagh

Children like books about everyday life, but they also need books which give them an outlet and an opportunity for imagination and phantasy. The twelve Griffin Readers supply this outlet. The reading material, comprising *The Story of the Three Pirates,* has been designed to help teachers in solving a difficult problem, that of teaching backward children in the Junior School—or even the Secondary Modern School—who still cannot read. There is, of course, no reason why it should not be used for other children, too, if teachers feel they have a group for whom it would be suitable. Books 1 to 12, *3s each. Illustrated.*

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in this type of music throughout the Solomons, and many new bamboo bands have been formed.

The price of the disc is 12/- Australian per copy, post free, and a discount of 25% is given to firms purchasing a number of copies for re-sale to their customers. Orders and enquiries about this and other discs available from the Commission should be addressed to the Social Development Section, South Pacific Commission, Box 5254, G.P.O., Sydney.

Descriptions of other discs made by the Commission will also appear in subsequent issues of the *Quarterly Bulletin*.

PRX4049 (12", 78 r.p.m.)

Beautiful Body.
Living Alone In The Sunset.
Performed by the Simbo Bamboo Band, British Solomon Islands Protectorate.
PRICE: 12/- Aust., post free.

Arthropoda Parasitic On Man And Domestic Animals In French Pacific Territories

MR. JEAN RAGEAU, medical and veterinary entomologist at the French Institute of Oceania in Noumea, New Caledonia, has compiled an inventory of *Arthropodo Parasitic on Man and Domestic Animals in the French Territories of the Pacific*. This work has been published in mimeographed form by the Office de la Recherche Scientifique et Technique Outre-Mer.

Mr. Rageau writes: "The arthropodal fauna parasitic on man and domestic animals in the South Pacific still remains a largely unknown field. With the exception of the Culicidae, no single family has formed the subject of comprehensive research or even a detailed inventory. However, a preliminary list of pathogenic arthropoda at present known in French territories of the Pacific is of some value whilst awaiting possible future compilation of a relatively complete catalogue which would require several years of intensive research and the collaboration of a number of specialists."

The author has personally studied the arthropodal fauna of New Caledonia and Dependencies, and also several Tahitian species. Earlier publications provided information on the other islands. In considering each species, the author briefly mentions its geographic regard to human or animal pathology.

Some General Observations

Although our knowledge of entomological fauna of medical and veterinary interest in French Pacific territories is still incomplete, Mr. Rageau indicates several general observations to be drawn from his work. These are:

—the relative poverty of species, especially in Polynesia, often compensated by a high level of population;

—the importance of introduced species with regard to the endemic element;

—the relatively small number of serious infections transmitted by arthropoda and their localization: malaria in the New Hebrides, plague in New Caledonia (apparently now extinct), filariasis, epidemic dengue, murine typhus (a few cases in New Caledonia), pyroplasmosis at present restricted to Tahiti. But considerable research still needs to be done in this field.

"From the zoogeographic viewpoint, the fauna of French territories in the Pacific would seem to be far from homogeneous," continues Mr. Rageau. "There are two distinct areas, western or Melanesian, and eastern or Polynesian. In the first, the fauna presents affinities with that of Australia and New Guinea, with an Indo-Melanesian tendency. In the second, it is considerably less rich and very closely related to Indo-Malayan fauna. However, each island group has its peculiar characteristics."

Mr. Rageau's survey will, he feels, provide a basis for health legislation and organization of entomological prophylaxis. It will also assist or encourage future entomological research thus contributing to improvement of health conditions and progress in stock-raising.

A lengthy bibliography (187 references) and an alphabetical index of species conclude the work.

Peanut Flour A Valuable Dietary Supplement

THE peanut is an excellent source of protein and of thiamin (vitamin B1), riboflavin (vitamin B2) and particularly nicotinic acid (niacin). Most of the peanuts entering world trade are, however, crushed for oil that is partly used as such, but mostly hardened to make margarine.

The main direct contribution of the peanut to the human diet is thus fat, the valuable proteins and vitamins being left in the press-cake or residue remaining after extraction of the oil. This residue is used as food for stock. Its nutrients are thus utilized for human nutrition only indirectly, and therefore less efficiently, by feeding animals whose meat or milk is subsequently used.

It is paradoxical that West Africa, where British and French territories are the world's largest exporters of peanuts, is also a region where dietary deficiencies of protein are particularly severe. The possibility of using de-fatted peanut residues in human nutrition has received much attention from French and Portuguese nutritionists interested in African problems. Their work has shown that the residue, ground to a flour, is a valuable supplement to diets poor in protein.

A recent paper by Adrian, Perissé and Jacquot in Part I of Volume 10 (1956) of *Annales de la Nutrition et de l'Alimentation* reports the results of feeding tests with young growing rats. It was found that diets based on millet and maize could not support normal growth, even when supplemented with minerals and fat-soluble vitamins. A diet of cassava (manioc) similarly supplemented led to the death of the experimental animals, no doubt because of its low protein content.

The addition of 15% of peanut flour to any of these diets, however, greatly improved growth, and the further addition of 3% of fish flour gave completely satisfactory results, even with the diet based on cassava.

The authors conclude that the deficiencies of protein and of B vitamins in a poor-grade African diet based on millet could be corrected by the daily addition of 90 grams (3 oz.) of peanut flour plus 18 grams (0.6 oz.) of fish flour. Even the peanut flour alone would give a considerable improvement.

—H. S. McKEE.

Leucaena Glauca As A Feed For Livestock

LEUCAENA GLAUCA is a leguminous shrub which is found at low elevations on many of the Pacific islands. It is known as mimosa in New Caledonia, as ipil-ipil in the Philippines and as koa haole in Hawaii. It is recognized in New Caledonia as a useful fodder for cattle, though in some areas it forms dense thickets which the beasts cannot penetrate.

Meal from sun-dried *Leucaena* leaves has recently been used in the Philippines to replace imported lucerne (alfalfa) meal in mixed poultry feeds. For the main constituents of nutritive value *Leucaena* meal showed on analysis better figures than lucerne meal:

PER CENT.:	PROTEIN	FAT	FIBRE	ASH
Leucaena meal	24.4	6.4	9.6	10.6
Lucerne meal	16.1	2.2	27.1	9.1

In grazing trials in Hawaii beef cattle have done well on pastures containing much *Leucaena*. It is also a valuable feed for dairy cows, though, like some other fodders, it gives an unusual flavour to the milk if fed just before milking.

Although *Leucaena* has been found satisfactory for cattle and for poultry, it has an odd effect on some other animals, causing their hair to fall out. This has been noticed with horses and pigs in Queensland and in South America. Cases of human loss of hair have also been reported from Indonesia, where *Leucaena* is sometimes eaten in times of shortage of other foods.—H. S. McKEE.

South Pacific Commission Technical Papers

Copies of Technical Papers, which are published both in English and French editions, may be procured from the South Pacific Commission, Nouméa, New Caledonia, or G.P.O. Box 5254, Sydney, Australia. Except where otherwise stated, price per copy, post free by surface mail, is 2/- stg. (2/6 Aust., 2/3 Fijian, 30 cents U.S., 1 New Guinea guilder)*.

NUTRITION

18. **Report on Nutrition Investigations by the South Pacific Commission in 1950.** November 1951.
22. **Chemical Composition of the Milk of New Hebridean Mothers.** F. E. Peters, biochemist, South Pacific Commission. February 1952.
23. **Nutrition Research Conducted in New Hebrides during 1951.** Sheila Malcolm, nutritionist, South Pacific Commission. April 1952.
50. **Nutrition Investigation in New Caledonia.** Sheila Malcolm. October 1953.
63. **Diet and Nutrition in American Samoa.** Sheila Malcolm. August 1954.
83. **Diet and Nutrition in the Trust Territory of the Pacific Islands.** Sheila Malcolm. July 1955.
85. **Etudes sur la Nutrition et l'Alimentation dans les Etablissements Francais de l'Oceanie** (Summary and Conclusion in English). Sheila Malcolm. April 1955.
95. **Bibliography of the Nutritional Aspects of the Coconut** (revised edition of T.P. 58). F. E. Peters. September 1956.
100. **Chemical Composition of South Pacific Foods**—An Annotated Bibliography. F. E. Peters. January 1957. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
106. **Some Food Problems In The Pacific Islands.** H. S. McKee. May 1957.
113. **The Diet of Mothers and Children on the Island of Guam.** Sheila Malcolm. January 1958.
115. **The Chemical Composition of South Pacific Foods.** F. E. Peters. January 1958.
118. **Nutrition and the Papuan Child.** H. A. P. C. Oomen and S. H. Malcolm. April 1958. (8/- stg., 10/-A., 9/-F., $1.20, 4G.)

PUBLIC HEALTH

12. **Tuberculosis Investigations by the South Pacific Commission in 1950.** May 1951.
24. **A Survey of Leprosy on the Island of Nauru.** Dr. C. J. Austin, Director, Makogai Leprosy Hospital, Fiji. April 1952.
27. **A Survey of Leprosy in the British Solomon Islands Protectorate.** Dr. C. J. Austin. July 1952.
56. **Leprosy in Netherlands New Guinea.** Dr. Norman R. Sloan. April 1954.
57. **Leprosy in the Trust Territory of the Pacific Islands.** Dr. Norman R. Sloan. April 1954.
62. **Leprosy in American Samoa.** Dr. Norman R. Sloan. July 1954.
64. **Dental Conditions in School Children of American Samoa.** Dr. Raymond G. Neubarth. August 1954.
67. **Ophthalmological Survey of the Trust Territory.** Dr. H. E. Crawford. September 1954.
69. **Leprosy in Western Samoa and the Cook Islands.** Dr. Norman R. Sloan. October, 1954.
96. **Health Education In The South Pacific.** G. Loison and L. L. Keyes. September 1956.

MOSQUITO-BORNE DISEASES

17. **Conference of Experts on Filariasis and Elephantiasis, Tahiti: Summary of Proceedings.** September 1951.
33. **A Survey of Malaria in the British Solomon Islands Protectorate.** Dr. R. H. Black, School of Public Health and Tropical Medicine, University of Sydney. November 1952.
60. **Some Aspects of Malaria in the New Hebrides.** Dr. R. H. Black. May 1954.
61. **Malaria in the Trobriand Islands.** Dr. R. H. Black. May 1954.
65. **Annotated Bibliography of Filariasis and Elephantiasis.** September 1954. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
66. **Distribution of Filariasis in the South Pacific Region.** Dr. M. O. T. Iyengar. September 1954. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
68. **Malaria in the Torres Straits Islands.** M. Josephine Mackerras and Dorothea F. Sandars. October 1954.
80. **Malaria Control and Research in Netherlands New Guinea.** Dr. R. H. Black. March 1955.
81. **Malaria in the South-West Pacific.** Dr. R. H. Black. March 1955.
86. **Distribution of Mosquitoes in the South Pacific Region.** Dr. M. O. T. Iyengar. 1955. (8/- stg., 10/-A., 9/-F., $1.20, 4G.)
88. **Annotated Bibliography of Filariasis and Elephantiasis. Part 2.** Dr. M. O. T. Iyengar. Jan. 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
104. **Developmental Stages Of Filariae In Mosquitoes.** Dr. M. O. T. Iyengar. May 1957.
105. **An Investigation On Filariasis In The Berau Region.** H. de Rook. May 1957.
109. **Annotated Bibliography of Filariasis and Elephantiasis. Part 3.** Dr. M. O. T. Iyengar. July 1957. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
110. **Enquete epidemiologique et entomologique sur la Filariose de Bancroft en Nouvelle-Caledonie et dependances.** M. Lacour et J. Rageau. (With Summary in English). August 1957.
117. **La repartition geographique des moustiques en Nouvelle-Caledonie et dependances.** J. Rageau. Mars 1958. (Available in French only).

TROPICAL CROPS

19. **Report on Copra Grading.** November 1951.
21. **Note on the Mycoflora of Rice Seed in the Territories of the South Pacific.** Dr. F. Bugnicourt, Director, Institut Francais d'Oceanie. January 1952.
31. **Cocoa Plantation Management in Western Samoa.** D. R. A. Eden, General Manager, New Zealand Reparation Estates, and W. L. Edwards, Assistant General Manager. October 1952.
36. **Cocoa Growing in Fiji Islands.** D. H. Urquhart, former Director of Agriculture, Gold Coast. December 1952.
37. **Cocoa Growing in Netherlands New Guinea.** D. H. Urquhart. January 1953.
38. **Coffee Growing in New Caledonia.** D. H. Urquhart. January 1953.
39. **Cocoa Growing in Western Samoa.** D. H. Urquhart. January 1953.
40. **Cocoa Growing in New Hebrides.** D. H. Urquhart. January 1953.
48. **The Management of Coconut Plantations in Western Samoa.** D. R. A. Eden. September 1953.
82. **The Manufacture of Copra in the Pacific Islands.** W. V. D. Pieris. July 1955. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
87. **L'agriculture vivriere autochtone de la Nouvelle-Caledonie,** par Jacques Barrau; precedee de l'organisation sociale et coutumiere de la population autochtone, par Jean Guiart. Janvier 1956. Available in French only. (20/- stg., 25/-A., 22/6F., $3.00, 10G.)
94. **Food Plants of the South Sea Islands.** Dr. E. Massal and Jacques Barrau. September 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
97. **Rice Production In The South Pacific Region.** R. Watson. October 1956.

PESTS AND DISEASES OF PLANTS AND ANIMALS

8. **Insect Pests in the Wallis Islands and Futuna.** From report by F. Cohic, Entomologist, Institut Francais d'Oceanie. December 1950.
9. **Report of Plant and Animal Quarantine Conference, Suva.** April 1951.
34. **Rhinoceros Beetle Control in the Kingdom of Tonga.** L. J. Dumbleton, Plant and Animal Quarantine Officer, South Pacific Commission. November 1952.
77. **A List of Diseases and Parasites of Animals Recorded in the South Pacific Territories.** Bilingual. December 1954.
78. **A List of Plant Diseases Recorded in South Pacific Territories.** Bilingual. December 1954.
79. **A List of Insect Pests Recorded in South Pacific Territories.** Bilingual. August 1955. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
101. **Parasites And Predators Introduced Into The Pacific Islands For The Biological Control Of Insects And Other Pests.** L. J. Dumbleton. March 1957.
107. **The Rhinoceros Beetle In Western Samoa.** R. A. Cumber. June 1957. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)
116. **Contribution a l'Etude des Cochenilles d'Interet Economique de Nouvelle-Caledonie et Dependances,** par F. Cohic. Fevrier 1958. Available in French only.

ECONOMIC CONDITIONS

54. **The Pacific Islander and Modern Commerce.** V. D. Stace, Assistant Economist, Reserve Bank of New Zealand. March 1954.
89. **Small-Scale Industry for the South Pacific—Preliminary Papers.** Cyril S. Belshaw. March 1956. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)
90. **Industrial Activity in Selected Areas of the South Pacific.** K. H. Danks. March 1956. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
91. **Western Samoa—An Economic Survey.** V. D. Stace. June 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
92. **Economic Aspects of the Coconut Industry in the South Pacific.** E. J. E. Lefort. September 1956. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)

CURRENT RESEARCH

5. **Fisheries and Animal Health Research Projects of Significance for the South Pacific Region,** conducted under the authority of the C.S.I.R.O., Australia. May 1950.
29. **Current Research in the South Pacific in the Field of Economic Development.** July 1952.

* Abbreviations used in the above list for the currencies quoted are: stg. (sterling); A (Australian); F (Fijian); $ (United States dollars); G (New Guinea guilders).

43. **Research in Queensland in Tropical Plant and Animal Industries.** Jacques Barrau, Technical Officer, South Pacific Commission. May 1953.
98. **Social Science Research In The Pacific Islands.** November 1956. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)
102. **Index Of Social Science Research Theses On The South Pacific.** April 1957. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)

CO-OPERATIVES

1. **The Co-operative Movement in the Gilbert and Ellice Islands.** H. E. Maude. February 1949.
42. **The Co-operative Movement in Papua and New Guinea.** Prepared by the Registry of Co-operative Societies, Port Moresby. February 1953.
51. **A Bibliography of Co-operation in the South Pacific.** December 1953.
75. **Catalogue of the Commission's Co-operative Library** (Bibliography of Co-operation). January 1955. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)

COMMUNITY DEVELOPMENT

2. **Community Development.** March 1950.
11. **Interim Reports on the Moturiki (Fiji) Community Development Project.** Howard Hayden, Director of Education, Fiji. May 1951.
26. **Further Education in the Cook Islands.** P. F. Henderson, Officer for Further Education, Cook Islands. July 1952.
35. **The Purari Delta—Background and Progress of Community Development.** November 1952.
45. **The Nimboran Community Development Project.** Dr. J. van Baal, Director of the Bureau of Native Affairs, Netherlands New Guinea. June 1953.
46. **The Koror Community Centre.** Reports supplied by the High Commissioner, Trust Territory of the Pacific Islands. August 1953.
74. **Educational Aspects of Community Development.** R. Thomson. January 1955. (4/- stg., 5/- A., 4/6F., $0.60, 2G.)
84. **The Communities Project Approach to Economic Development.** H. Belshaw. July 1955.

EDUCATION

3. **The Village Library.** April 1950.
4. **Visual Aids in Education in the South Pacific.** A. L. Moore, Visual Aids Consultant. April 1950.
14. **Educational Broadcasts to Samoan Village Schools.** Department of Education, Western Samoa. May 1951.
15. **Libraries for Beginners.** Dr. and Mrs. Kenneth Todd, Kwato Mission, Eastern Papua. July 1951.
32. **Types of Organization in Adult and Mass Literacy Work.** D. B. Roberts, Organizer of Island Literature, South Pacific Commission. August 1952.
44. **The Use of the Vernacular in Teaching in the South Pacific.** G. J. Platten. June 1953.
47. **Central Vocational Training Institution.** F. J. Harlow. August 1953. 5/- stg.; plans available sep. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
72. **Literacy Teaching for Adults.** Karel Neijs. November 1954. (5/- stg.)
73. **Educational Evaluation—A Documentary Survey.** J. C. Nield. December 1954.
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